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NEW ZEALAND
JOURNAL OF
# Agriculture
JANUARY - 1958

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# Gorse executioners !

Same yellow-peril flowers, same old spiky stems digging in stubbornly over your best land. Everything is the same except your attitude. Now you no longer worry about it. You just get in there with a tankful of Weedone Special and a trusty HI-VOL gun at your side.

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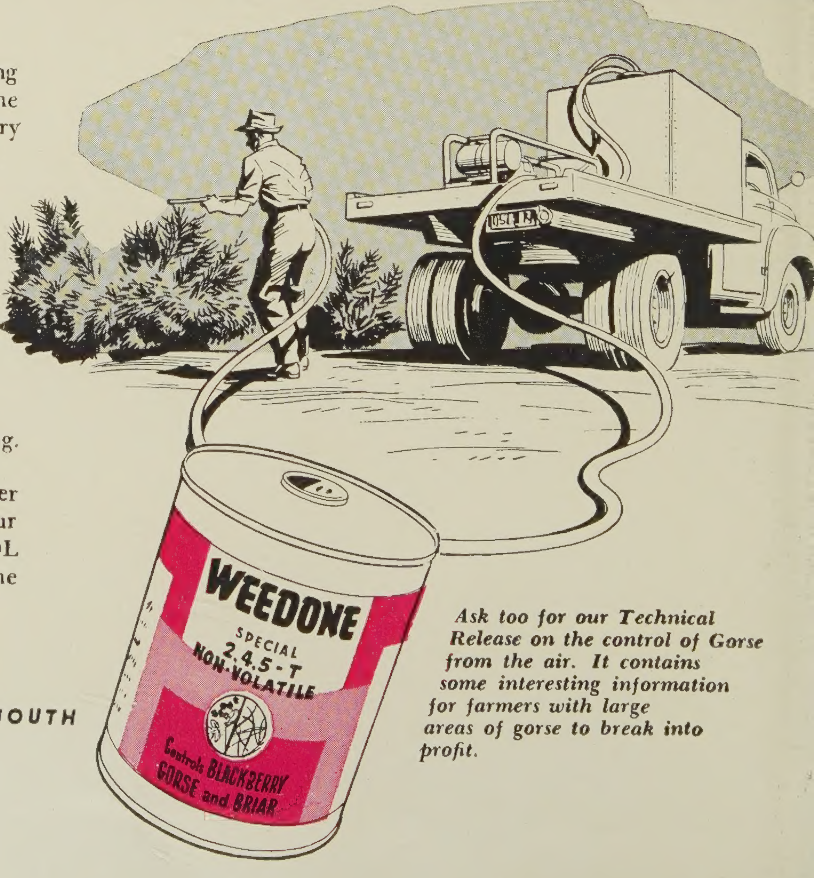

*Ask too for our Technical Release on the control of Gorse from the air. It contains some interesting information for farmers with large areas of gorse to break into profit.*

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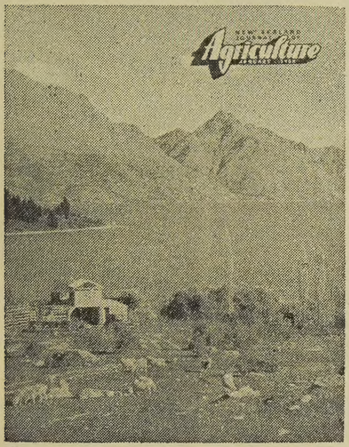
## *This Month's Cover*



*Lake Wakatipu, in the South Island lakes district, is the subject of this month's cover from a colour photograph by Tom Lloyd. For many years the stock-carrying capacity of this mountainous country, with some of New Zealand's largest hill country sheep runs, was severely limited by the rabbit pest. The "killer" policy of the Rabbit Destruction Council and ultimate devaluation of the rabbit have brought a transformation in this country. They have made possible over the last 10 years, with the help of improved management and new farming techniques, an increase in sheep numbers of about 33 per cent.*

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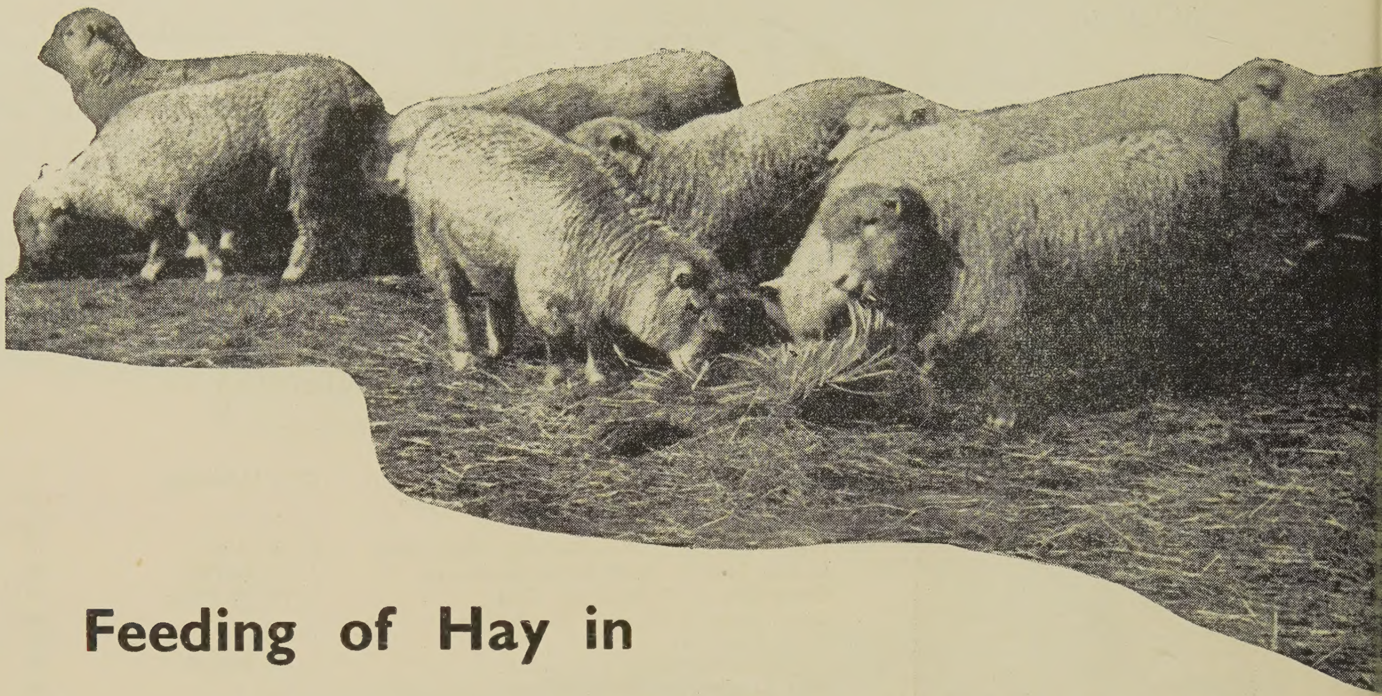


# Feeding of Hay in Facial Eczema Control

**FEEDING of hay to sheep during facial eczema risk periods when they have to be kept off pastures has been consistently advocated and practised by the Department of Agriculture's Ruakura Animal Research Station. However, many farmers in districts most subject to facial eczema have been severely critical of the recommendation because they consider that sheep have to be "starved on to hay". In this article, which is adapted from a paper given at this year's Ruakura Farmers' Conference Week, C. P. McMeekan, Superintendent of Ruakura Animal Research Station, describes how hay should be fed to North Island sheep which usually do not receive it.**

FEEDING of hay to sheep in the hands of farmers who have given it a fair trial has so proven itself over the past three seasons as to have radically changed the attitude toward the practice of a significant proportion of the sheep farming community. Cries of "Sheep won't eat hay", "McMeekan's cure is worse than the complaint", "Scientists advocate starving sheep", "Hay feeding quite impracticable outside a Government farm", and the like, may be heard less in the days ahead.

It is no longer necessary for Ruakura or anyone else to prove that not only will North Island sheep eat hay but, fed enough of it, they can be maintained in good order. Incidentally, these two discoveries were not the outcome of research. Many a South Island farmer, accustomed to hard winters with no grass, and most Australian farmers inured to drought feeding problems, have been more than puzzled at the North Island sheep farmers' reluctance to accept as both reasonable and practical a system of feeding sheep which has been part and parcel of the South Island and Australian pastoral scene for generations.

It must be stressed that the preventive techniques for facial eczema control at present recommended, including hay feeding, are the best now available. Ruakura is actively interested in developing easier techniques. Field studies in the management control of facial eczema now promise to be far more profitable as a result of recent significant advances in facial eczema research.

There is nothing really new to say about hay feeding of sheep, whether related to facial eczema control or not. So many questions of practical importance, however, are received each year that it seems worth while summarising several points that have come from practical experience on both Ruakura and farmers' properties during the last 3 years, when the system has been tried extensively.

## Amount Necessary

If sheep are to be held on a diet of hay without suffering loss of body-weight, a daily ration of 2lb. each is needed. At this level there is no starvation. At this level body-weight is maintained. Two pounds per day is the ideal, but 1lb. per day is sufficient to maintain breeding ewes without serious loss of body-weight. At this lower level ewes can be held in reasonable order for a month or so. One pound per day, therefore, should be regarded as the minimum amount to be aimed at. A good compromise is half-way between these two amounts, 1½lb. per ewe per day.

The total quantity required in any season obviously depends on the number of days over which feeding is necessary. Experience over the years when protection from facial eczema risks has been considered necessary suggests that a month's feeding should be allowed for as an annual insurance policy. At the 1½lb. level this approximates one bale of hay per ewe or 1000 bales for a 1000-ewe flock. This quantity is entirely reasonable and practical on fat lamb areas and other areas of easy contour in eczema risky districts. It is not impossible on much of the handier hill country where farmers can purchase hay from the lowlands in years when it is cheap and hold it for use in times of trouble.

The provision of this quantity, of course, involves a change in outlook of the North Island sheepman. It necessitates acceptance as a fact that complete reliance on grass as a feed for sheep involves risks against which protection is possible only by a change in the farming system.

## Area Where Fed

Hay feeding for eczema protection requires the provision of a small paddock within which sheep can be confined at the necessary high stocking rate to eliminate intake of any green grass. Preferably there should be two such areas on the 1000-ewe farm to overcome the disadvantages of excessive trampling and soiling during wet weather when sheep are concentrated at the rate of 200 per acre and over for any length of time. A second area permits alternate use in very wet years.

Ideally, protection areas must be free draining and of a contour permitting rapid run-off. Ideally, too, they should carry shade trees. An ample water supply is absolutely essential. Sheep on a hay diet must drink more water than when they are on grass.

## Method of Feeding

Sheep have to be trained to eat hay, they dislike wet hay, and they will not eat soiled hay.

A ewe flock that has never had experience of hay feeding must be handled differently from one accustomed to it. Usually it takes a week of confinement to persuade a completely new flock to consume the necessary amount of hay per day. Such ewes will not eat for the first 2 days after being shut up. Accordingly, there is no point in putting hay out at this stage except in token quantity. A few bales will start the more inquisitive ewes off and thus teach the others.

The best teacher, however, is hunger, and by the third day the sheep are usually sufficiently hungry to make a heavier rate of feeding worth while. The quantity put out should be increased as they take it until the 1000-ewe flock is getting 30 bales a day. Forty bales are needed to get to the optimum 2lb. level. Hay should be fed twice daily. This is important. It reduces waste and increases intake.

If the flock has been fed hay on previous years, starting off again is much easier. Ewes accustomed to hay rapidly teach newcomers to eat it, and such a flock will come to a high intake level much more quickly than a completely fresh mob.

### Dislike for Wet Hay

Because sheep dislike wet hay, feeding while rain is falling should be avoided. On most rainy days in the Auckland Province sufficiently long periods elapse between showers to enable smaller quantities than the total ration to be fed and cleaned up before excessive wetting occurs. Farmers aiming at good management at such times have been prepared to feed five or six times a day, despite the extra labour involved. One 1000-ewe flock this year was handled in this manner and consumed 38 bales a day over 5 very wet days when 1in. to 3in. of rain fell.

Because of the high loss of hay soiled through being fed out on the ground during both wet and fine weather, sheepmen interested in conserving hay should feed in racks. The simplest form is a netting rack round the fenceline, supplemented if necessary with a few movable racks in the field itself. The fairly severe trampling which occurs across the front and round such racks is an additional reason for providing at least two paddocks for facial eczema control.

The average fat lamb farmer who replaces a proportion of his ewe flock

each year with ewes probably unaccustomed to hay feeding would be wise to train them. If this is done, the difficulty of securing a high intake of hay, if and when this becomes necessary, is very much reduced.

It is unfortunately true that a small proportion of North Island ewes either never eat hay or eat insufficient of it during the short period of confinement usually necessary. Such ewes present a problem.

If they are young, valuable ewes carrying enough condition to afford to lose 20lb. or 30lb. liveweight, they should still be shut up even if they do not eat. If, on the other hand, they are already thin and relatively aged, as many fat lamb farmers' ewes are, they should be released and run on the safest-looking, most mature pasture on the farm. It must be emphasised, however, that such ewes may contract eczema. A farmer must balance this risk against the risk of their low performance as producers if they are to be starved so that they become still poorer in condition.

## Management of Ewe Flock

One thing has stood out during the last 3 years' experience of hay feeding. Ewes that have had to undergo a period on hay, particularly when the level of hay feeding is below that recommended, stand the treatment far better if they begin it in good condition. Ewes already thin cannot be expected to get any fatter on a low hay intake. They must get thinner and if in really poor condition at the start, they can give trouble.

Ruakura is prepared to alter the kind of advice which it has given previously on the management of a fat lamb ewe flock. In the past it has been suggested that early weaning should be practised and the breeding ewe flock done fairly hard during the next 2 months and before flushing and tupping. In practice, this recommendation has often resulted in ewes being in low condition by the beginning of February.

Because of the difficulties just mentioned, and because Ruakura records suggest that the subsequent lambing percentage of a ewe is related to her liveweight at tupping time (heavier ewes giving a better percentage) Ruakura now believes that ewe flocks in eczema districts should not be permitted to lose excessive weight during December and January. Rather should ewes be fed so that they are carrying a reasonable amount of condition by the beginning of February, when hay feeding in an eczema risk season may become necessary.

## Attendant Advantages

The provision of hay for sheep on the fat lamb farm can be associated with many production advantages. Fed to ewes over the period of flush autumn growth it permits all this growth to be conserved over the whole farm. Wintering the ewe flock is never easier than in a facial eczema year when the recommendation for hay feeding protection has been carried out. The impact of the system on the whole winter and pre-lambing grass supply position seems so favourable that the cost of the hay is likely to be more than covered by the value of the high-quality grass conserved.

If not needed for facial eczema control, hay reserves can always be cashed by purchase and wintering of young cattle to the benefit of the farm as a whole. In general, too, much more hay could be made on the average fat lamb farm than is made today. Pasture control during the flush period is easier and cheaper, since fewer expensive cattle have to be purchased. Quality of feed for milking ewes and fattening lambs can be maintained at a high level with resulting benefit to fat lamb output.

**So convinced have some farmers become of these points that they have suggested that if facial eczema teaches North Island sheepmen to crop and to conserve hay, it will ultimately prove a blessing in disguise.**

---

# Grading Points for Export Butter and Cheese

### Contributed by the Dairy Division

BUTTER-MANUFACTURING companies which obtained an average grade of 93.75 points or more and cheese-manufacturing companies which obtained an average grade of 92.50 points or more during the year ended 31 July 1957 are listed below in order of merit. Of the total listed, the 17 butter factories and 15 of the cheese factories are in the North Island and the remaining 2 cheese factories are in the South Island.

## Creamery Butter

| Factory | Registered number | Brand | Production tons | Graded for export tons | Average grade points | Grading port |
|---|---|---|---|---|---|---|
| Konini | 1,203 | Konini | 1,563 | 765 | 94.339 | Wellington |
| N.Z. Dairy (Ngatea) | 291 | Anchor | 3,483 | 3,354 | 94.167 | Auckland |
| United | 1,296 | Whariti | 595 | 143 | 94.160 | Wellington |
| Kuku-Manakau | 905 | Ohau | 504 | 377 | 94.145 | Wellington |
| Kaikohe | 40 | Kaikohe | 806 | 770 | 94.142 | Auckland |
| Cheltenham | 3 | Pakeha | 1,478 | 708 | 94.128 | Wellington |
| Te Aroha-Thames Valley | 344 | Overseas | 4,073 | 3,509 | 94.119 | Auckland |
| N.Z. Dairy (Morrinsville) | 415 | Anchor | 3,347 | 3,346 | 94.066 | Auckland |
| Awahuri | 664 | Red Rose | 1,439 | 579 | 93.955 | Wellington |
| Te Awamutu | 397 | Lotus | 2,911 | 1,378 | 93.929 | Auckland |
| Levin | 910 | Lake | 1,766 | 749 | 93.882 | Wellington |
| N.Z. Dairy (Mt. Eden) | 378 | Anchor | 3,326 | 149 | 93.860 | Auckland |
| Wangaehu | 1,326 | Wangaehu | 635 | 427 | 93.854 | Wanganui |
| Taihape | 1,188 | Tikapu | 211 | 72 | 93.847 | Wanganui |
| Waimea | 835 | Waimea | 1,095 | 102 | 93.844 | Wellington |
| Wairoa | 1,345 | Wairoa | 518 | 108 | 93.833 | Hastings |
| Okitu | 1,270 | Okitu | 147 | 80 | 93.816 | Gisborne |

## Cheese

| Factory | Registered number | Brand | Production tons | Graded for export tons | Average grade points | Grading port |
|---|---|---|---|---|---|---|
| Wright's Bush | 206 | Wright's Bush | 158 | 156 | 93.240 | Bluff |
| N.Z. Dairy (Matamata) | 318 | Anchor | 1,351 | 1,334 | 92.839 | Auckland |
| Greytown | 529 | Greytown | 961 | 846 | 92.779 | Wellington |
| N.Z. Dairy (Waihi) | 144 | Anchor | 1,218 | 1,121 | 92.774 | Auckland |
| Dalefield | 9 | Dalefield | 1,335 | 1,227 | 92.764 | Wellington |
| Awatuna | 60 | Awatuna | 1,081 | 1,072 | 92.718 | New Plymouth |
| Belvedere | 486 | Belvedere | 1,085 | 1,090 | 92.698 | Wellington |
| Maketawa | 342 | Maketawa | 740 | 742 | 92.683 | New Plymouth |
| Seaward Downs | 702 | Seaward Downs | 468 | 471 | 92.660 | Bluff |
| Alton | 1,890 | Alton | 820 | 783 | 92.634 | Patea |
| T. L. Joll (Taikatu) | 1,723 | Maori Chief | 438 | 438 | 92.601 | Patea |
| Massey | 16 | Massey | 40 | 16 | 92.593 | Wellington |
| Parkvale | 1,240 | Parkvale | 612 | 568 | 92.582 | Wellington |
| Featherston | 360 | Featherston | 1,852 | 1,633 | 92.553 | Wellington |
| Bruntwood | 1,534 | Bruntwood | 964 | 920 | 92.543 | Auckland |
| Bidwill | 270 | Bidwill | 314 | 297 | 92.543 | Wellington |
| Brooklands | 1,619 | Brooklands | 460 | 456 | 92.516 | New Plymouth |

Other butter companies whose butter was graded mainly for the local market and for which an average grade of 93.75 points or more was obtained for the combined local and export gradings were as follows:—

| | | | | | | |
|---|---|---|---|---|---|---|
| Murchison | 1,888 | Airship | 477 | 358 | 94.396 | Lyttelton |
| Karamea | 1,570 | Karamea | 413 | 310 | 94.182 | Lyttelton |
| Golden Bay | 146 | Sovereign | 913 | 827 | 94.179 | Lyttelton |
| Westland | 145 | Westland | 860 | 646 | 94.119 | Lyttelton |
| Kaikoura | 302 | Kai | 652 | 441 | 94.117 | Lyttelton |
| Collingwood | 1,254 | Golden Hills | 481 | 462 | 94.022 | Lyttelton |
| Inter-Wanganui | 6 | Inter-Wanganui | 451 | 280 | 94.009 | Lyttelton |

# Broodiness in Laying Birds

**BROODY or "clucky" birds occasionally give trouble to household poultry keepers, some of whom appear to have little knowledge of broodiness and how to control it. This article by the Animal Industry Division of the Department of Agriculture discusses broodiness in laying birds and its control in household poultry flocks.**

THE first indication that a laying bird is going broody is that she will remain on the nest for a long time after laying or will sit in a nest without laying. In the next stage of broodiness the bird will stay in the nest box during the night as well as the daytime. As the broodiness intensifies it becomes increasingly difficult to make the bird leave the nest, and when she is pushed off the nest she will return immediately. At this stage a broody hen when approached will ruffle up her feathers and usually utter a characteristic squawk. Any attempt to remove her from the nest is met with persistent pecking.

## What is Broodiness?

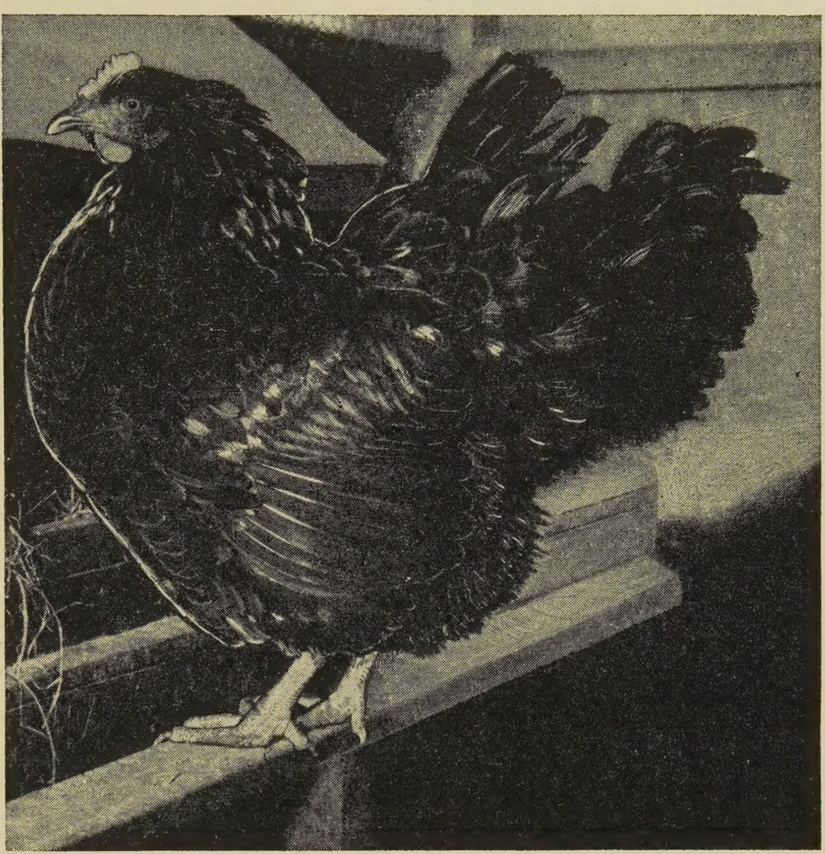
Broodiness is an entirely natural condition of birds. It is usual for wild birds to lay a number of eggs and then to sit on these to hatch them out. Broodiness in poultry is an indication of the desire to sit and hatch out eggs. It is an inherited character and is not caused by the way in which a householder may feed or manage his laying birds, as is thought by some people.

## Not All Birds Affected

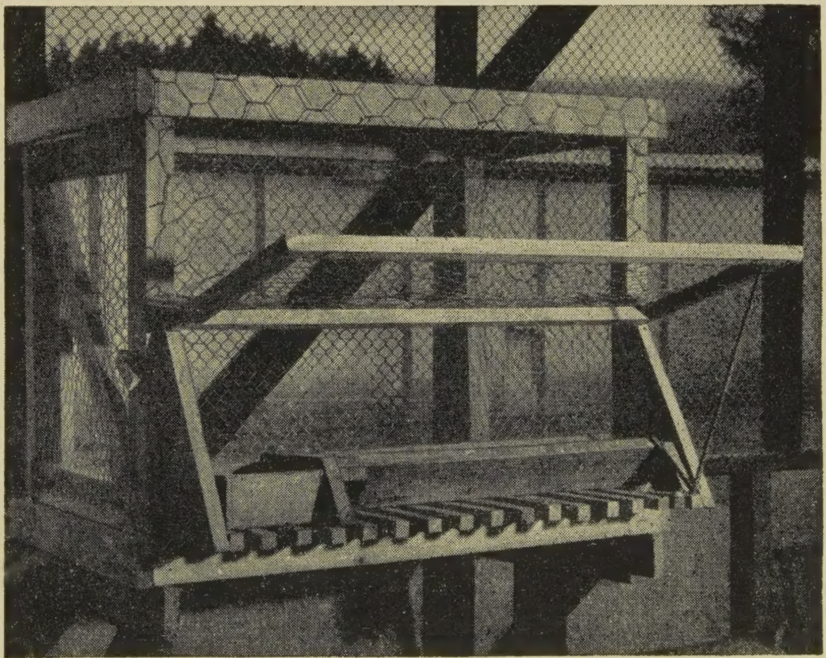
Breeds of poultry can be classified broadly as light and heavy. White Leghorns, Minorcas, and Anconas are examples of light breeds, and Australorps, Rhode Island Reds, and Light Sussex are examples of heavy breeds. A great majority of female light-breed birds do not go broody. Only rarely is a broody Leghorn pullet or hen found in a flock. It is rare on the other hand not to find broody pullets or hens in a flock of Australorps during the warm, summer months.

Crossbred pullets are now very popular for laying and are often recommended to household poultry keepers as suitable for the home henhouse. Crossbred pullets behave in a similar manner to heavy breeds in respect of broodiness. It is claimed, however, that where a light-breed male bird is used in a crossmating with heavy-breed females broodiness in the progeny will be less than if a heavy-breed male is mated to light-breed females. Thus White Leghorn x Australorp pullets are expected to show less broodiness than Australorps x White Leghorn pullets.

(Continued at foot of page 6)



A broody Australorp hen showing typical ruffling of feathers on the neck and back. The tendency to droop the wings is also a symptom of broodiness.



A broody coop built with wire-netting sides and a wooden-slatted floor, and with a metal trough for water and a wooden trough for food. With slats in the side of the coop to allow the birds to feed these troughs can be fixed outside the coop with advantage.

# Mr. R. B. Tennent Appointed Director-General of Agriculture

**MR. R. B. TENNENT, formerly Deputy Director-General of Agriculture, has been appointed Director-General in succession to Mr. E. J. Fawcett, who retired last month.**

MR. TENNENT was born in Scotland in 1893 and attended the Queensland Agricultural College in 1914, where he gained diplomas in agriculture. He joined the field staff of the Queensland Department of Agriculture and served in the A.I.F. in the First World War, holding the rank of lieutenant on discharge.

In 1918 Mr. Tennent attended the West of Scotland Agricultural College and was awarded the National Diploma in Dairying. He returned to Queensland, where he formed a dairying school for Australian returned servicemen, and in 1920 joined the New Zealand Department of Agriculture as Instructor in Agriculture at Dunedin. He visited the U.S.A. in 1925 to study methods of irrigation and in 1928 he was appointed Fields Superintendent for the Otago-Southland district. Mr. Tennent carried out in Central Otago the first investigations and demonstrations of irrigation on which irrigation practices are now based. This early work provided a sound basis for the beginning of Canterbury schemes and his continued interest has helped to raise the efficiency of the Department's extension and investigation work in irrigation.

The Young Farmers' Club movement had his wholehearted support from its inception in Otago and he has continued to do much to help the development of the federation to its present place as an indispensable part of the farming industry. In 1934 he was promoted to Director of the Fields Division and transferred to Wellington. He was appointed Assistant Director-General in 1943 and Deputy Director-General in April last year.

He is an authority on grassland farming and as Fields Superintendent at Dunedin did much to develop intensive grassland farming in Southland. In 1948 he visited Britain to assist in a campaign for grassland development and in 1956 he went to Japan to advise the Japanese Government on the development of hill country pastures and livestock management.

Mr. Tennent has represented New Zealand overseas on many occasions. He undertook a mission for UNRRA to China in 1946 to investigate the advisability of New Zealand's supplying dairy cattle to China. He attended the third meeting of the International Federation of Agricultural Producers at Guelph, Ontario, Canada, in 1949 and visited the United States to promote interest in New Zealand seeds. In 1950 he returned to establish trials of New Zealand grass seed mixtures there.

Mr. Tennent led the New Zealand delegation to the conference of FAO in Rome in 1953 and later went to the United States of America for discussions regarding the sale of New Zealand seeds. He was leader of a New Zealand delegation to Japan in 1955 to investigate the fused calcium-magnesium process for the manufacture of phosphatic fertiliser and has been to Australia several times and to Nauru and Ocean Island.

He returned to New Zealand last month after leading delegations to the FAO conference in Rome and to the first of annual discussions between New Zealand and Britain on agricultural and trade policies.

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## *Broodiness in Laying Birds*

(Continued from page 5)

Apart from breed, laying birds vary individually in broodiness. One bird may constantly go broody while another in the same pen may never go broody during the whole of a laying season. Broodiness as a character in laying birds is inherited. Thus if a poultry breeder includes in his breeding pens birds which have shown a marked degree of broodiness, it is highly likely that a substantial number of the progeny will have broodiness well developed in them. Thus it is obvious that a poultry breeder who uses heavy-breed birds should mark his broody pullets and avoid placing them in the breeding pens later.

Broodiness in poultry can be effectively controlled within reasonable limits by eliminating from the breeding pens as far as possible birds which have been broody at any time. This is the job of an efficient poultry breeder, and the amount of trouble that a household poultry keeper has with broodiness will depend markedly on how his birds have been bred.

Lastly, broodiness can be most troublesome during spells of warm or hot weather. Warmth induces broodiness more readily than does cool weather.

### Broodiness Undesirable

Broodiness is undesirable mainly for two reasons. First, as a bird becomes broody she will go out of lay. **The longer the bird is allowed to remain broody the more will it lose condition and consequently the longer it will be in coming back into lay.** Secondly, broody hens spend all day in the nest boxes. If they are allowed to sit on eggs during the daytime, the heat of their bodies starts to break down the quality of these eggs.

### How to Cure a Broody Hen

To cure a bird of its broodiness the bird must be removed from the warm, comfortable conditions of the nest box as soon as possible after the owner has decided that the bird is broody. The longer a bird is allowed to remain broody in a nest box the more difficult it becomes to break her of this broodiness.

Broody birds should be placed in a broody coop, either inside the laying shed or in a sheltered position outside. A broody coop is a box-like structure with slatted wooden front, sides, and floor (see lower illustration on page 5). Wire netting can be used for the front and sides in place of slats. The intention is to keep the bird under comparatively uncomfortable conditions with air all round her, conditions the opposite to those in a warm nest box.

The coop should be fitted with a mash trough and water container. It is important that broody birds be fed normally with mash and grain. This will keep up their condition and prevent the egg organs from going out of production. When householders keep broody hens short of feed, in the belief that this will stop the broodiness more quickly, the birds are liable to go into at least a partial moult and are invariably longer coming back into production than is necessary.

As soon as the weather becomes warmer household poultry keepers are advised to visit the laying shed just before dark and should keep this up during spring and summer. When a broody bird is found on a nest it should be placed in the broody coop and **kept there for 3 or 4 days.** The bird is then let out of the coop in the morning of, say, the fifth day. If the same bird is on the nest box again in the evening, it should have a further 4 days in the coop.

**If broodiness is detected at an early stage** and the bird has not inherited a strong urge toward broodiness, a comparatively short stay in the coop will discourage it. Occasionally a bird may appear to be broody and when it is put in the broody coop it promptly lays an egg. The householder will not necessarily have made a mistake. Some birds do lay a few eggs after they start to go broody, and such birds should be given the usual treatment of, say, 3 days in the coop and then be let out.

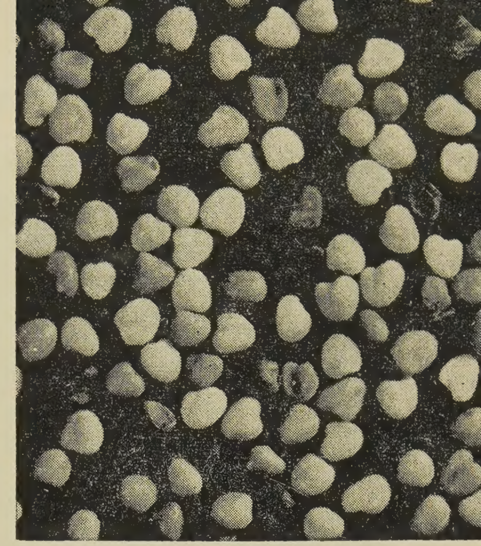
Where more than one bird is put into the broody coop and on different days each bird can be marked with a coloured ring on the leg or even with coloured string so that they can be taken out in the right order.

# Seed Production in New Zealand

# White Clover

By R. G. JOLLY,
Instructor in Agriculture, Department of Agriculture, Christchurch

WHITE clover is the most important clover species in pasture production in New Zealand. Its ability to grow on a wide range of soil types makes it a very valuable plant, and very few seed mixtures do not include it. Its response to dressings of phosphatic fertilisers and its ability to draw on and consume nitrogen from the air make it an ideal plant for use in almost all pasture-improvement programmes. In addition to the stimulus which it can give to the grasses in the sward, white clover itself makes a valuable and direct contribution to the total production of the pasture.



White clover seed (five times natural size).

THE characteristics of white clover (*Trifolium repens*) are overground runners, which root at the nodes to form new plants, hairless leaves and stems, and short stipules. The large-leafed form is sometimes confused with red clover, but red clover can be distinguished readily by its hairiness. Strawberry clover is very similar to white clover, but differs in that the leaflets are dark green and oval. White clover can be distinguished readily from alsike clover by its shorter stipules.

White clover seed is heart shaped and it can pass through cattle uninjured and germinate freely in the dung. The plant is a perennial, and its ability to spread by runners makes it very valuable in any field, because it soon fills up the bare spaces and gives a good cover to the soil.

## Place in New Zealand Farming

White clover has a most important place in New Zealand farming. It is the keystone on which pastoral production in New Zealand is based, and in its absence keeping up production is difficult. Because of its ability to grow under a wide range of conditions it is included in almost all seed mixtures for both plains and hills in most parts of the country. Being a legume, it is able to assist in making nitrogen available for the grasses.

Conditions which are not suitable for its growth are those on undrained swamps, very light shingly soils under low-rainfall conditions, and soils of very low fertility.

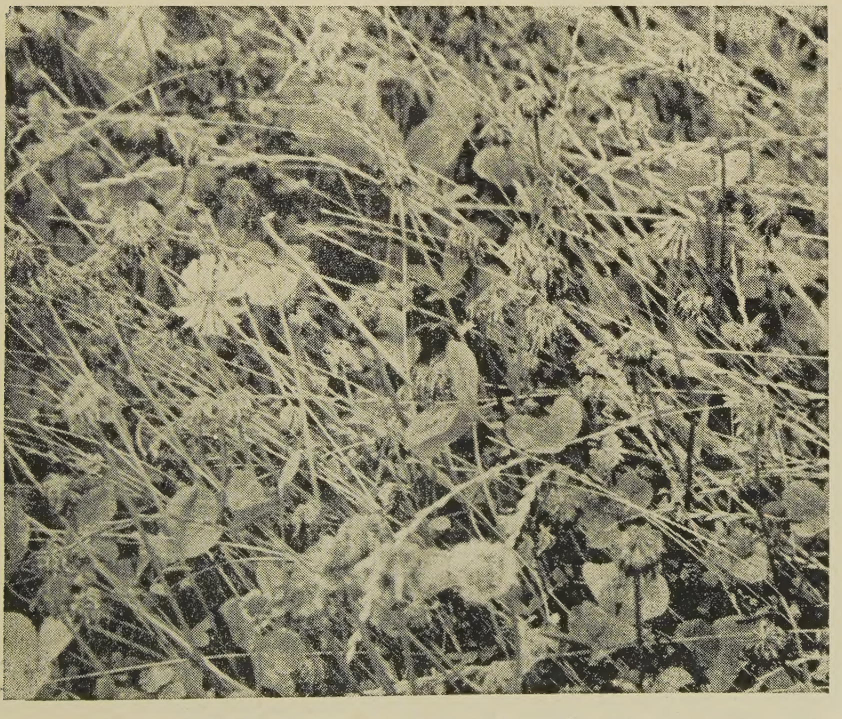
On the high country tussock areas, where it might not be expected to grow, white clover is the basis of the seed mixture in tussock grassland improvement work. Given the correct fertiliser treatment, white clover will flourish, and it has been successfully established on South Island tussock country as high as 4000ft.

## History of Seed Production

White clover seed has been harvested in New Zealand for 60 to 70 years, but from figures available it would seem that for some years the area harvested ranged only between 2000 and 3000 acres for the whole country. This was because white clover seed could then be imported at a price to compete with the locally grown product, and farmers were not aware of the great benefits to be derived from the use of an improved strain of white clover in their pastures.

Originally the main areas producing seed were Hawke's Bay, Canterbury, Marlborough, and Southland. The areas in Hawke's Bay and Southland were small, the bulk of the seed being grown in Canterbury and Marlborough.

The saving of white clover seed has been revolutionised in recent years. With the selection of improved strains, a widening appreciation of the seed in a mixture, and the impetus of land development the demand for seed in New Zealand has increased. The export market has also developed, particularly for certified seed, as a sequel to the results obtained overseas with the New Zealand pedigree strain.



Part of a white clover seed crop, nearly ripe.

# PRODUCTION OF WHITE CLOVER SEED

A crop of white clover in full flower closed for seed production.

Expanded production (50,000 acres were harvested for seed in 1954-55, the bulk of this being in Canterbury) has been facilitated by the use of the header harvester to replace the clover huller in threshing the crop. In this way the harvesting of the seed has been made much simpler, involving less risk of crop loss and enabling larger areas to be handled with less labour.

## Soils and Climate

White clover for seed production requires a climate that is dry during the latter part of December and January. Under such conditions harvesting of the crop presents little difficulty, but for good crops reasonable rains are needed in autumn, winter, and spring to promote the necessary growth for cutting.

Soil types on which seed has been harvested vary considerably. In some seasons the heavy silty loams give excellent crops, but if rain falls in December or January, these areas are suitable only for the production of hay. The medium silty loams of the Canterbury Plains are probably the most suitable for seed crops. On the lighter soils good crops are obtained in seasons when crops on the heavier soils are ruined because of too much moisture. Yields of 100lb. to 150lb. per acre have been obtained from land worth £5 per acre.

As white clover is included in almost all seed mixtures, and by management can frequently be made the dominant constituent, most areas in country not too broken or steep and with a favourable climate can be considered potential seed-producing land.

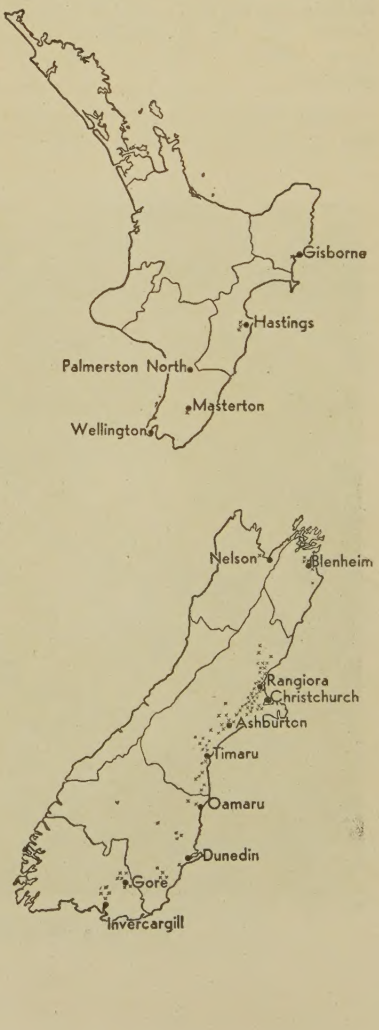
## Sowing Methods

Of late some farmers have sown special paddocks in white clover alone for seed production, but this is by no means the general practice. In areas more suited to seed production there has developed a system of sowing a simple mixture of 20lb. to 25lb. of perennial ryegrass and 3lb. to 4lb. of white clover with the aim of harvesting both for seed in successive years.

More recently on the medium to better types of land short-rotation ryegrass has been substituted for perennial ryegrass with very good results. The pasture is so managed that in the first season ryegrass seed is harvested. This necessitates a more lenient type of grazing in early spring to promote ryegrass growth and keep the white clover in check, though on most occasions the amount of white clover in the sward in the first harvest does not present a problem.

In the second harvest the area is managed to suit the clover, involving much heavier grazing in winter and spring to keep the ryegrass in check and encourage the clover to take charge, which it usually does. Under

The crosses indicate the districts where white clover is harvested for seed. →



this method the two crops are harvested at their peaks of production.

The seeds mixture is either broadcast or drilled, depending on climate and situation, the drill being used where conditions are dry at the time of sowing. Where seed production is the aim seed is usually sown after a summer fallow, and this method has much to recommend it. In other cases it may be sown with a rape crop or undersown on a wheat, oat, or linseed crop. When the seed is sown with a crop the resultant stand is usually weedier than with the other method, but some heavy seed yields have been obtained from stands sown in this way.

White clover sown in autumn does not produce a great deal of seed in the first season unless the weather is exceptional; the best crop is usually obtained at the second harvest. If sown in spring under a cover crop, white clover will give a good crop of seed the following harvest; that is, in 15 to 18 months. For establishment either spring or early autumn sowing is satisfactory.

## Fertiliser Requirements

It has become very evident during the past 10 to 15 years that one essential for clover growth is the application of lime and phosphate. If lime has not been applied previously, at least 1 ton per acre is required, either worked into the soil before the crop is sown or, if the area is autumn sown, applied when the clover has become established.

A dressing of 1cwt to 1½cwt. of superphosphate per acre should be applied when the seed is sown. On very fertile soils these amounts may not be necessary, but for good clover growth lime is essential; instances are known in which, without lime, no clover has grown, but with liming up to 1½ to 2 bags of seed per acre have been obtained.

If phosphates are used on established areas, their application is preferable in early autumn rather than in spring. With spring applications herbage growth tends to be bulkier at a time when it is not required and the flowering period is likely to be extended, with consequent loss of quality in the seed.

A white clover crop maturing in windrows.

## Management of Seed Areas

The management of an area to be saved for seed aims at having the clover plants growing vigorously and with strong root development. The foliage growth is kept under control by grazing until the flower heads begin to appear, when the plants expend their energy in seed production rather than leaf production. This behaviour is accentuated where the supply of moisture in summer is not liberal, but in wetter districts and seasons the improved strains of white clover will continue to produce abundant foliage and smother the flower heads.

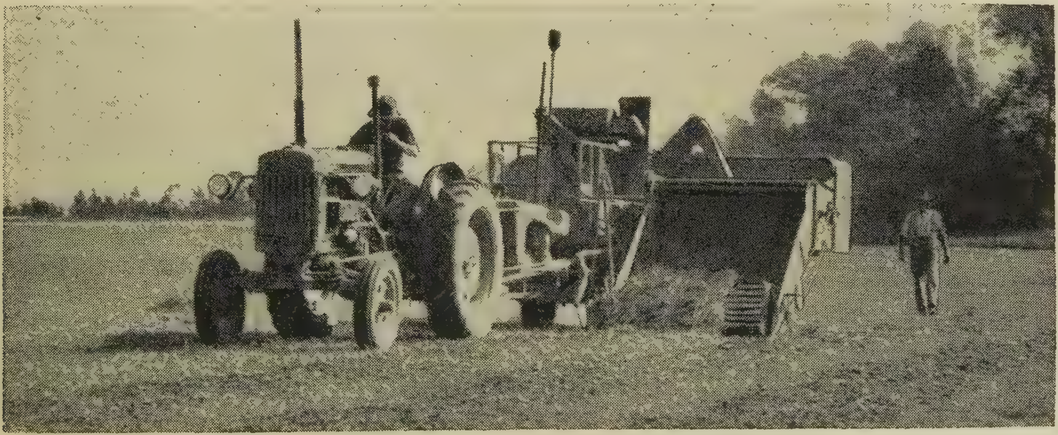
The ideal treatment is to control the growth in autumn by reasonably close grazing; the area should be grazed to about ½in. as evenly as possible, the growth allowed to recover, and then grazed again, leaving about ½in. of growth to go into winter. If some growth is made during winter, it can be fed on the rationing system—about an hour a day for either cattle or sheep.

In spring the area should be grazed closely during the "flush" growth period and kept reasonably short until about the middle to the end of October, or even into November in some seasons, depending on the situation. Generally, the area should be closed for a seed crop when the first flower heads begin to appear.

The soil type has some influence on the length of time in spring for which the land can be grazed. Areas on good clover land with a good supply of moisture can be closed later than those on light plains land. An area is best closed up too soon rather than too late. Should growth become excessive, the area can be grazed again, but if it becomes dry and the area has been grazed closely, a reduced yield or no crop is likely.

Cattle probably are better than sheep for the final grazing, as they are unlikely to graze too closely, though the area may need trimming up after cattle and before closing for seed. When not managed carefully sheep can spoil a potential crop by overgrazing. After the area has been closed for seed no other treatment is required until harvest.

Under irrigation the treatment is somewhat different, as water is on hand at all times. The area is closed later, and just before closing water is applied. A further application is given if the weather is such that the plants show signs of wilting. The main objective is to get full flowering without so much moisture in the soil



The header harvester has contributed greatly toward increasing the amount of white clover saved for seed.

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White clover is an important constituent of pastures throughout New Zealand. In suitable districts, such as Canterbury, it is used for both seed production and grazing.

that second growth is produced at a time when the bulk of the crop is beginning to ripen off.

## Time of Cutting

Ideal weather for harvesting white clover seed is hot and dry without heavy winds to scatter the cut material. Rain is not welcome after the crop has been cut because usually it causes second growth, which comes up through the cut material and often makes drying impossible. Where strong second growth occurs the difficulty can often be overcome by use of an aerator to lift the seed swath, though it may be necessary first to undercut with the mower.

A fortnight to 3 weeks' dry weather, starting between the middle of December and the end of January, depending on the district, would be ideal for the harvesting of seed.

The time to cut clover for seed is very difficult to gauge, as flowering takes place over a long period. There are often three flowerings, depending on the weather, with the bulk of the crop in full flower about the last week in November or the first week in December. The crop is cut when at least three-quarters of the flower heads are ripe and mature seed can be rubbed out in the hand, with the balance of the flower heads ripening off and the seed beginning to change colour.

The number of seed heads that are really ripe, not the number of flower heads showing, is the guide to the stage at which to cut the crop. As the crop ripens the ripe heads droop over, and unless the crop is examined closely, its condition cannot be accurately assessed.

White clover, unlike ryegrass, will stand for a reasonable time even after ripening without coming to a great deal of harm. Where high winds are a problem the crop is left until it is dead ripe, which means that probably it can be cut one day and threshed the next.

## Methods of Harvesting

In the past the crop was cut with a mower, the swath allowed to dry out, and a side rake or hay rake used to draw the crop into windrows. From these it was carted to stack or directly to the clover-hulling machine for threshing. If clover was stacked, it was not always possible to thresh immediately, which meant covering the stack to make it reasonably waterproof. All this handling involved loss of seed, but now with practically all harvesting done with a header harvester the crop can be left until ripe, cut, and threshed without any other handling.

The crop is cut with a mower, usually with a 5ft. cutter bar, and two shedder boards draw the swath in to the approximate width of the header. If a cutter bar longer than 5ft. is used, more material has to be drawn in and this slows up the drying of the crop. The density of the crop and the type of header to be used govern the length of the cutter bar.

In normal crops harvesting does not present much difficulty, but often on lighter soils and in dry periods when there is not sufficient bulk of material to hold the clover heads and form a windrow harvesting can be a problem. It is often these short crops, rather than the bulky leafy crops, that yield best. These short crops can be handled by attaching a flat sheet of galvanised iron or similar material to the back of the cutter bar, and when sufficient material has gathered on the iron sheet by raking it off into heaps. This method requires a man to walk behind the mower to take off the material, but the returns more than justify the expense and labour.

Short crops have been direct headed successfully, but instead of the conventional cutter bar of the header being used, one gang of a normal gang mower was attached in such a way that the cut material was fed directly into the throat of the header. Also, one type of forage harvester has been adapted to salvage seed crops which would otherwise have been abandoned.

Commercial machines are now available which aid in the harvesting of white clover seed crops.

## Threshing

The weather at the time of threshing is important, as attempting to thresh the crop when the material is clammy will cause serious losses. For ideal threshing conditions the heads should

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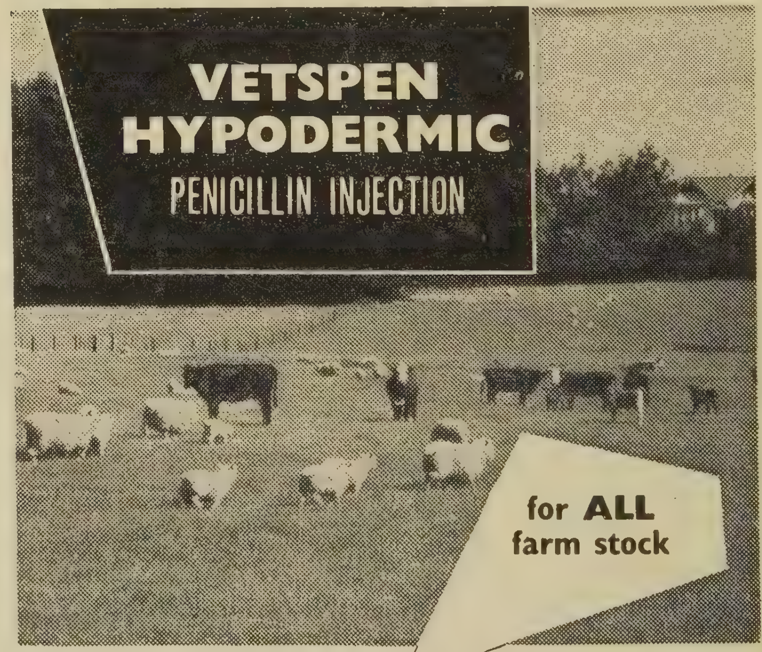

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Various types of headers are available, but they will all do a satisfactory job if the crop is fit and proper attention is paid to the speed and setting of the drum.

## Yields

Yields of white clover vary greatly from field to field, district to district, and season to season. Yields as high as 600lb. of machine-dressed seed per acre have been obtained, but yields of 100lb. or more may be considered satisfactory. Though the yield does not necessarily decrease as the pasture ages, other factors being equal, the best yield is obtained usually in the second harvest season after autumn sowing.

The presence of honey bees is also a factor in white clover seed production. Where they are present in sufficient numbers and the weather is suitable a good setting of seed can be expected. The white clover seed crop is very susceptible to frost injury, and a light frost in late November or early December can reduce the yield and may even spoil any prospect of a seed crop. In districts susceptible to frosts at that period of the year growers close their seed areas later; then if a frost does occur, less damage is likely.

## Impurities

The material removed in the machine dressing of seed from white clover-dominant stands averages from 30 to 40 per cent. of the line, depending on the season and the age of the pasture. Ribgrass and dock seeds are two of the main impurities, and these are difficult to separate from white clover seed. Another impurity of some consequence is suckling clover (*Trifolium dubium*); as seed of this species is of almost the same size range as white clover seed, it is very difficult, if not impossible, to remove during dressing. Seeds of falcatula and timothy are also difficult to remove from white clover lines.

Any area containing a high proportion of suckling clover is better abandoned for seed production. In certain seasons it is possible to get some measure of control by allowing the area proposed for seed production to get away in spring, cutting it about the end of October for a light crop of hay, and allowing the aftermath to run to seed. This reduces the yield somewhat and makes the harvest a little later, but usually it gives a crop of seed with a minimum of suckling clover.

## Maintenance of Seed Pastures

The maintenance of white clover areas for seed production is not easy, and it is not a good practice to take seed from an area year after year. This has been done in certain favoured localities by the application of abundant lime and superphosphate, but white clover is a crop that can be planned only for the first or second harvest. After that the seasons take a hand, and often a crop appears "out of the blue" when one was not even contemplated.

Continued seed production from an area ultimately affects the sward. Pastures that have been seeded for ryegrass or white clover or both deteriorate, but with good fertiliser and lime applications, combined with careful stock management, areas on the better soil types can be harvested a number of times for white clover seed and still maintain a first-class pasture. On the lighter plains soils in both islands one or perhaps two crops in favourable seasons are as much as can be expected.

A factor which greatly influences the decision as to when to seed the area is the price; a yield of 30lb. of machine-dressed seed may pay with seed at 6s. a pound, but is scarcely worth the loss of grazing with seed at 2s. a pound.

## Strains of White Clover

Investigations initiated by W. Davies and E. B. Levy disclosed that New Zealand, like other countries, had a wide range of white clover strains. The longest-lived and highest-producing strains were localised on the very fertile lands of Rangiora and Woodend in North Canterbury and parts of the Heretaunga Plains in Hawke's Bay. Very little ploughing of these areas had been done, and under conditions of high soil fertility and permanent pasture management a superior strain of white clover was developed. At the other extreme an almost annual type of clover with low production was present on the light cropping lands of Canterbury. In other districts intermediate types and mixtures of types were present.

The export trade in white clover seed of 30 years ago recognised two main types, "wild" white and "stubble" white. The wild type generally was that from permanent grassland areas; the stubble type was largely the product of frequently cultivated areas, as often as not the produce of volunteer growth following the harvest of a cereal. It was not surprising that such clover was of inferior strain, that confusion existed about the quality of New Zealand white clover, and that individual lines frequently were described wrongly.

Whether the presence of inferior strains was primarily the result of local conditions or of the importation of white clover seed which was an important feature of the seed trade in earlier years, even when seed was being exported, it is impossible to say. Probably both factors had some influence in their development.

## Seed Certification

The presence of these divergent strains provided a good field for the introduction of a scheme of seed certification for white clover, which was initiated in 1930. Chiefly because of the volunteer nature of white clover in many districts and the difficulty of obtaining any great degree of strain purity in naturally occurring lines, progress under seed certification, apparently, was at first slow. Many modifications of the scheme have been necessary to meet changing conditions, but real progress in the development of a superior strain under certification has now become apparent.

Certification was applied first to seed from old pastures and then to natural superior strains, but as a pedigree strain was selected from the best natural strains and seed supplies became available, this formed the key material for the certification scheme. The scheme has made possible a much wider distribution of seed of better strain quality and, with direct benefit to production, has extended the sowing of white clover seed into areas where inferior volunteer strains grew previously and white clover seed was not sown because it "came naturally".

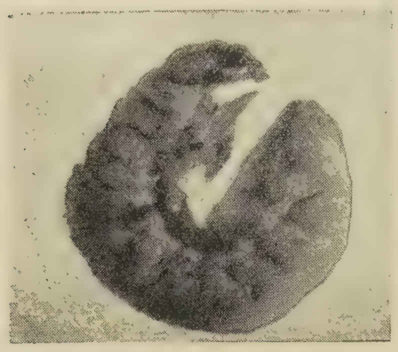
Certified white clover seed is classified as follows:—

Certified Government Stock seed, produced under contract by the Department of Agriculture from nucleus seed supplied from selected stock by the Grasslands Division of the Department of Scientific and Industrial Research. This Government Stock seed is distributed under supervision through commercial channels for further seed multiplication in the more favourable seed producing districts.

Certified Pedigree seed is the produce of an area sown with Government Stock seed, the sown area being subject to a satisfactory field inspection report and the first harvest seed being required to achieve a set standard under laboratory (picric acid) test. Seed from the second or subsequent harvests is classified according to the results of a plot test of seed from a previous harvest.

Certified Mother seed is produced in the first and subsequent harvests from areas sown with Pedigree seed which have complied with the standards on field inspection.

Certified Permanent Pasture seed may consist of the produce of any white clover seed area, provided a



(*Department of Scientific and Industrial Research*

The grass-grub.

machine-dressed sample of the line concerned attains a satisfactory standard as determined by the picric acid test.

## Insect Pests

White clover, like other pasture plants, has its insect pests. The porina caterpillar (*Oxycanus* sp.) and the grass-grub (*Costelytra zealandica*) can be responsible for a very heavy death-rate of plants, especially if the area has been seeded—in fact, the closing of an area for seed often sounds the death knell of the pasture on it. In certain seasons, however, an application of lime and superphosphate and good autumn rains have resulted in remarkable recovery on an area badly eaten out by grass-grub. The seed shed at harvesting, the natural trailing habit of the plant, and its ability to root at the nodes help to bring about this recovery.

The brown beetle, the adult form of the grass-grub, is on the wing from November onward, depending on the locality, and finds the condition of the pasture just before harvesting ideal for laying its eggs, which hatch out at a time when the plant has already had a setback from harvesting. The grubs attack the roots of the plants about 2in. below the ground, and unless good rains fall the death-rate in plants may be very high.

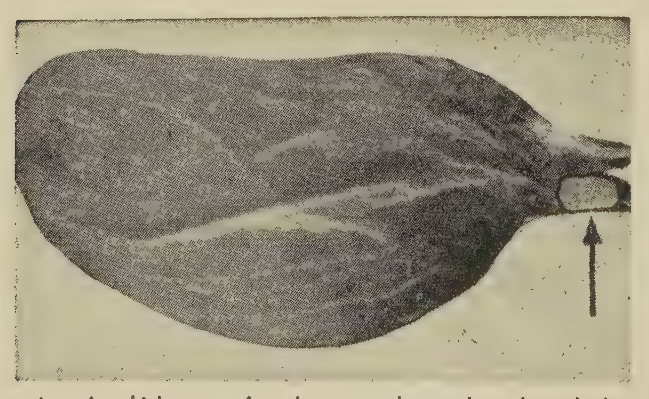
The porina moth is on the wing between November and January. It also lays its eggs in pastures and thrives where growth has been allowed to get away. The juvenile form, or subterranean caterpillar, feeds at night on the leaves of the plant. If in sufficient numbers, eventually it cuts the growth to ground level and the plant dies. The caterpillar feeds well into winter at a time when growth is at its lowest ebb, so that the plant has no chance of survival. During the day the caterpillar buries itself 4in. to 6in. below ground and only excessive moisture will bring it to the surface.

Both the grass-grub and porina caterpillar can be controlled with DDT or lindane. These materials, applied at 1lb. (100 per cent. para para isomer DDT or lindane) per acre will proof the ground against grass-grub and porina for 2 years. At 2lb. per acre they should remain effective for 3 years.

Treatments should be applied when the seed area is being sown down or subsequently with the early autumn topdressing, and are best applied, as an insurance against attack, before grub damage becomes evident.

**DDT and lindane should not be applied while the clover is in flower; otherwise the bee population will be seriously reduced.**

The clover case-bearer (*Coleophora spissicornis*) is a moth which lays its eggs when the clover is in flower. These are hatched out when the seed begins to ripen, and the grubs feed on the immature seed. Seed damage and loss arising from this cause is seasonal, but appears to have become increasingly important in recent years, especially in Canterbury, where some severe losses resulted in the 1955 harvest. No method has yet been devised for the control of this pest.



Area in which eggs of a clover case-bearer have been laid at the base of a clover petal

Porina caterpillars.

## Growth of Export Trade

New Zealand requires about 750 tons of white clover seed a year for her own requirements, so that despite the quantity exported each year New Zealand's best market is still her own.

As far as records show it would seem that New Zealand first began to export seed in any quantity about 1918 to 1920, and that between 1922 and 1924 prices for white clover seed rose to 2s. 6d. and 3s. a pound. This demand no doubt was brought about by the prospects of further exports, because by that time the considerable development of the bush country of the North Island had slackened off and there were surpluses of seed.

The seed exported at that time was drawn mainly from the Kaiapoi, Woodend, and Rangiora districts, which subsequently were proven to have a superior type of white clover. This happy chance was responsible for giving New Zealand wild white clover a good reputation in the British market. The exports grew from a few tons in those years to about 1165 tons in 1955-56, of which 1124 tons were certified.

## Benefits of Industry

Undoubtedly the greatest single contribution to improved methods of producing white clover seed has come from the use of the header harvester. Its introduction has lessened the work and reduced the risk, and has made possible the harvesting of areas which under older conditions of harvesting would have been unprofitable.

The identification of superior strains of white clover under certification, the development of a pedigree strain from the best natural types available, and the expanded use of white clover seed in pasture mixtures in New Zealand have been prominent features associated with the development of the industry. Coupled with these have been the recognition given overseas to the better strains of New Zealand white clover and the place which these have won, particularly in the United Kingdom, leading to the present overseas export market. All these factors are high lights in the development of an industry which has brought benefits to the whole farming community.

## Facial Eczema

# Disease Risks in Stock during Shutting-up

By J. C. GERRING,
Animal Research Extension Officer,
Department of Agriculture's Ruakura
Animal Research Station, Hamilton

IT has always been recognised that the measures advocated for control of facial eczema are associated with certain other disease hazards. The more important of these include haemonchosis and salmonellosis, and as it is important to understand the nature of these diseases so that they can be recognised and prompt remedial measures taken, where available, this article, an adaptation of a paper given at the Ruakura Farmers' Conference Week in June, describes conditions favourable to the onset of the diseases, symptoms, and best control measures.

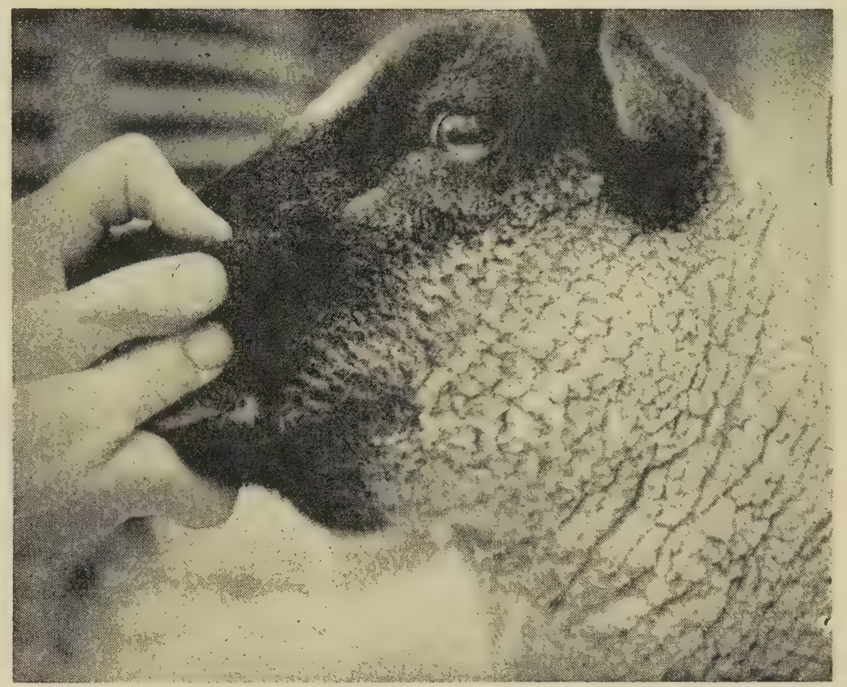
ADULT ewes in thrifty condition possess a high natural resistance to salmonellosis and haemonchosis. Any sudden and severe check in the level of feeding, however, can break down this resistance. When in addition to this sheep are crowded together ideal conditions are set up for their rapid spread through the flock. Overcrowding by itself is of minor importance in initiating the disease. This is indicated by the fact that sheep are commonly stocked at the rate of 200 or more to the acre when break fed on crops, with no harmful effects. In districts where crops are not commonly grown the risk of these disease hazards can be reduced by training sheep to eat hay and feeding it during the shutting-up period along the lines suggested by Dr. C. P. McMeekan in an article on page 2 of this issue.

### Salmonellosis

Salmonellosis in sheep is an infectious bacterial disease causing an accute inflammation of the fourth stomach and intestines. Infected animals excrete the organisms in the dung, and other animals running with them pick up infection by mouth by grazing the contaminated pastures. With few exceptions only adult sheep are affected.

Since the disease was first diagnosed in New Zealand in 1949 most outbreaks have occurred in the Hawke's Bay, Manawatu, and Wairarapa districts.

Once the infection has been introduced into a flock a number of ewes which recover become carriers. These remain apparently healthy until a severe check in the level of feeding breaks down their resistance and produces clinical symptoms. If at the same time sheep are crowded together, infection can quickly spread to other members of the flock.



A hogget showing "bottle jaw" typical of heavy infestation with *Haemonchus contortus.*

Apart from isolated cases salmonellosis occurs mainly from midsummer to early autumn, with a peak incidence in January. Though most outbreaks are associated with the fasting of ewes after weaning, and during yarding or transport, they also occur after shutting-up for facial eczema control.

Affected ewes may be found dead. Others appear sluggish and tucked up and are obviously uninterested in their surroundings. These may scour profusely or pass small quantities of light green material which may be flecked with blood. Because of their fevered state and loss of fluid, sick ewes seek the shade or hang around the water trough. Death may occur within 24 to 48 hours.

### Control

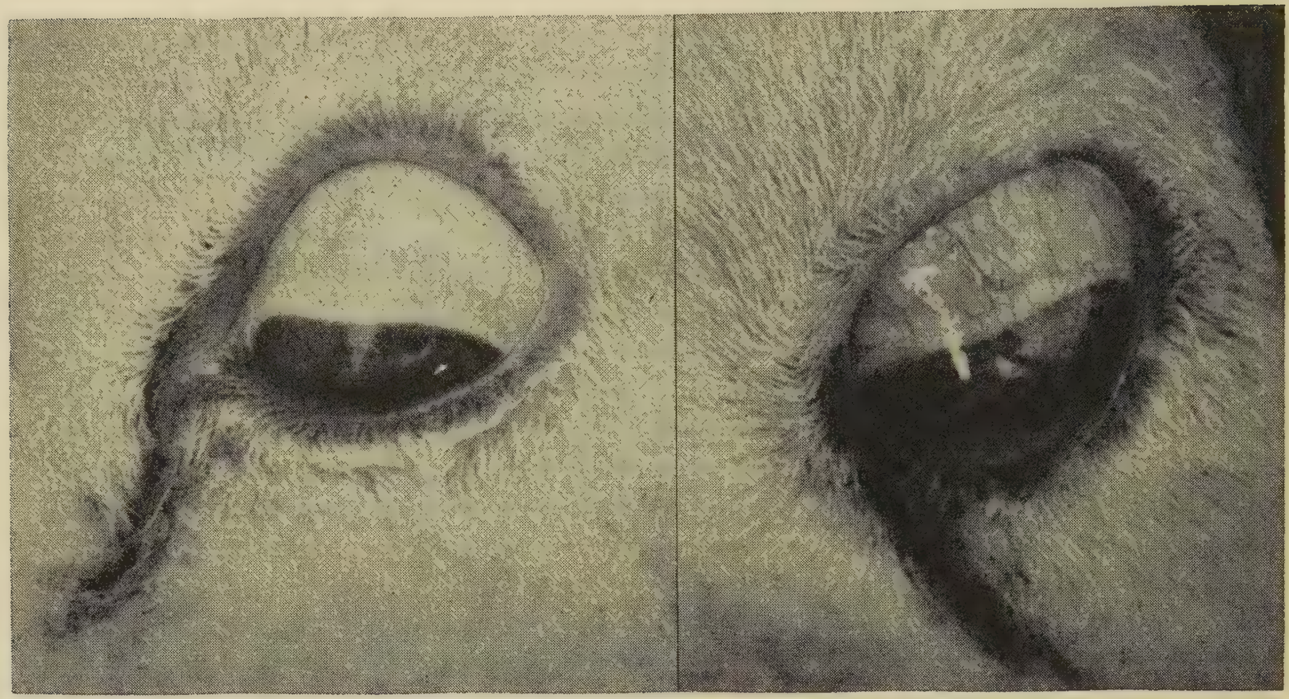
Treatment with antibiotics has been successful in some cases, but because of the rapidity with which sheep die it is not a practical means of control.

In districts and on farms with a high incidence of salmonellosis the only practical remedy is to grow summer crops so that the sheep do not suffer a check when taken off pastures for facial eczema control.

### Haemonchosis

Haemonchosis is a parasitic **disease** brought about by heavy infestations of the barber's pole worm *Haemonchus contortus.* Its occurrence is widespread. Outbreaks are particularly prevalent from January to the end of April and are common 2 to 3 weeks after rain. This worm is a prolific egg layer, each female having an output of 5000 eggs per day. Because of this, heavy infestations can build up so rapidly in warm, humid weather that sheep may die while still in good condition. Prompt diagnosis and treatment are therefore the most essential measures to control this disease.

The worms suck blood from the wall of the stomach. In heavy infestations an affected sheep can lose several pints of blood in a week. Symptoms of anaemia therefore are characteristic



The eye of a ewe seriously infested with *Haemonchus contortus* is abnormally pale (left), the blood vessels in the upper, opaque part of the eyeball being scarcely visible compared with those in the eyeball of a normal hogget (right), which are clearly visible.

of haemonchosis. These are easily recognised by examining the eyes and gums of a few sheep in the flock. As the disease can affect even the best-conditioned ewes, this examination should not be confined to just the thinner animals. The eyes and gums of ewes seriously infested are abnormally pale. The blood vessels which run across the upper, opaque part of the eyeball are almost invisible. In more advanced cases a soft, dropsical swelling may be present under the jaw—the so-called "bottle jaw". The lips themselves may also be swollen. Affected animals are listless and tire easily when driven.

On post-mortem examination of a freshly killed animal the adult worms can readily be detected. In heavy infestations the liquid contents of the fourth stomach, if still warm, are visibly agitated by the active movements of these worms. The individual worms themselves are up to 1in. long and present a typical striped appearance resembling a barber's pole.

**Control**

If haemonchosis is diagnosed, every animal in the flock should be drenched immediately with phenothiazine. Phenothiazine is practically 100 per cent. effective against *Haemonchus*; in addition it is completely harmless even where several times the normal dose is administered. For these reasons no other drug should be considered for the treatment of this disease.

Drenching should be repeated in 14 days, and thereafter every 3 weeks until the disease has been brought under control.

Used in this way phenothiazine will prevent many deaths. However, because recovery from anaemia is necessarily slow, an immediate response in the thrift of the ewes cannot be expected. Once danger from facial eczema is over the flock should be given the best feed available. Fortunately shutting-up itself substantially increases the amount of feed available on the rest of the farm.

Haemonchosis is widespread in its occurrence. Outbreaks are particularly prevalent during warm, humid weather typical of years in which facial eczema is a danger. On these grounds it is believed that the routine dosing immediately before their release of all ewes which have been shut up for a week or more would be a sound preventive practice.

Pink eye is a contagious disease caused by a micro-organism, *Rickettsia conjunctivae*. It is included here as a disease risk only because the crowding together of sheep for facial eczema control does increase its rate of spread through the flock. It is widespread in New Zealand and is most prevalent during spring, summer, and autumn, but occasional cases also occur in winter.

Most cases clear up spontaneously without treatment in 1 to 2 weeks. In a few severely affected animals symptoms may persist for as long as 6 weeks. Treatment of these with antibiotics such as aureomycin, terramycin, or chloromycetin will aid recovery. No cases are known where sheep have become permanently blind, though this may occur in the field owing probably to accidental injury.

After sheep have recovered infection persists for 3 to 4 months in about 50 per cent. of cases. In a few it may last as long as 9 months. Such carrier animals are active spreaders of the disease. For this reason the isolation of animals showing symptoms is useless as a means of control. More than half the recovered animals remain resistant to a second attack for more than a year. About 10 per cent. lose their resistance and become susceptible again in about 8 months. This second attack produces much milder symptoms than the first.

Losses occur only from some accident or where the resulting blindness interferes with the ewe's normal grazing at some critical time.

It might well be an advantage deliberately to encourage an epidemic of pink eye at a time when this is likely to have the least harmful effect. This would confer a useful immunity for some time and prevent further serious trouble under more difficult circumstances.

By overdrilling this paddock in autumn a farmer was able to overwinter a yearling beast per acre on what was a clover-dominant pasture.

# Overdrilling of Pastures and Crops

By L. W. BLACKMORE,
Instructor in Agriculture, Department of Agriculture, Dannevirke

WHERE overdrilling can be successfully practised it has much to recommend it because it is a cheap, once-over method of pasture improvement and the area is out of production no longer than the time taken for the introduced species to establish. Overdrilling has extended the usefulness of oversowing practices to include more difficult conditions where broadcasting has not been successful. These are some of the reasons so much interest has been aroused in the practice within recent years. It is intended in this article, the concluding section of which will appear next month, to set out broadly the circumstances under which overdrilling has been successful; to explain the underlying principles; and to describe the best procedures under various circumstances.

THE loss of ryegrass species from sown pastures has long been a problem confronting farmers, a problem which has been greatly accentuated since the introduction of short-rotation ryegrass, because of its more temporary nature. Various methods of introducing ryegrass into existing pastures have been used in the past in an effort to maintain productive capacity. Surface sowing without cultivation has in general given poor results. Surface working has increased the chance of success by reducing plant competition and providing a measure of tilth for covering the seed. The method has, however, given variable results and is often wasteful of seed. The feeding out of hay or using a paddock as a run-off from a crop and then sowing seed and trampling in are other methods that have been tried with varying degrees of success.

More recently the lax grazing or closing up of short-rotation ryegrass or dominantly short-rotation ryegrass pastures during late summer to allow a light crop of seed to set and fall to the ground and come away with autumn rains has given very worthwhile results. In seed-producing areas the saving of short-rotation ryegrass for seed often results in a dense strike of new plants on paddocks harvested.

Overdrilling of pastures is a mechanical method of placing the seed, and usually the fertiliser also, directly into the soil, as distinct from the accepted practice of broadcasting on the pasture surface with or without prior cultivation. Seed placed directly into the soil is much more certain to have an uninterrupted supply of moisture, and the proximity of the fertiliser often gives the seedlings, and especially clovers, an establishment advantage, even on soils relatively well supplied with phosphate. These features make for a quick, even strike, early establishment, and usually a substantial reduction in seeding rates.

## Early Trial Work

The first overdrilling experiment in this country was laid down at Sawdon Flat on the Mackenzie Plains of South Canterbury in early October 1948. A standard hoe coulter grain drill fitted with grassland tips which were designed specially for this trial was used. These special points gave the drill substantially increased penetrating power and allowed both the seed and fertiliser to be placed directly into the soil in 7in. rows.

In this trial the results from overdrilling under the low-rainfall conditions prevailing (approximately 18in. per annum) were strikingly superior to broadcasting, which failed almost completely.

This trial proved that red, white, subterranean, and alsike clovers and also lucerne could be established successfully on this cloverless country without cultivation. This was a very encouraging beginning and since then farmers in the area have sown some

## OVERDRILLING

thousands of acres in this way with good results. In a 10-acre experiment that was overdrilled in 1951, the equivalent of 2 sheep per acre was carried on country with a normal capacity of about 1 sheep to 5 acres.

Not until the autumn of 1954 was the first overdrilling trial using short-rotation ryegrass and red clover laid down in the North Island, near Dannevirke. This work was followed up by Massey Agricultural College at Palmerston North, and in the following autumn a combined and comprehensive Massey College-Grasslands Division trial was laid down using a disc drill and grassland tips fitted to the coulters of a standard grain drill. These two methods were compared with broadcasting alone and with broadcasting after light and heavy surface cultivation.

The trial demonstrated that under the conditions experienced short-rotation ryegrass could be successfully introduced into a clover-dominant pasture by overdrilling without prior cultivation, the total herbage (clover plus grass) being greater for overdrilling than for broadcasting alone and for broadcasting after light or heavy cultivation.

Overdrilled clovers in a trial on the Mackenzie Plains, South Canterbury, 15 months after sowing. This was the site of the first overdrilling trial, in 1948. The overdrilled area carried the equivalent of 2 sheep per acre, compared with the normal carrying capacity of 1 sheep to 5 acres.

### Results to Date

To give some lead on where overdrilling is likely to succeed the results to date are discussed under the following headings:—

**1. Low-fertility native swards:** These include mainly flat and easy country that is virtually devoid of clovers, such as the Mackenzie Plains in South Canterbury. This is tussock country 1500ft. to over 2000ft. above sea level carrying a weak sward of browntop, chewings fescue, sweet vernal, and other species. The eastern area is an arid belt with an annual rainfall of between 15in. and 20in. The soil is wind-blown and fluffy, and penetration with overdrilling equipment over much of the area is not difficult.

Departmental trials on the flats in the Cass district in Canterbury, with a rainfall of 40in. to 45in., showed the superiority under these conditions of overdrilling over broadcasting and also over broadcasting after pitch-pole harrowing. The country is tussock grassland with a browntop-dominant turf. These swards are very difficult to penetrate and the use of overdrilling as a means of land improvement in these areas depends on the development of suitable equipment.

In the Cass trials the results from overdrilling of clovers have been good. On the other hand the results with grasses, with the possible exception of cocksfoot, have been poor. It is logical to assume that grasses should not be introduced until a strong clover base has been established.

With the development of new equipment there may be a field in the future for overdrilling ryegrass into good hill country of easy contour where the clovers are strongly established and the natural ryegrass content is low.

**2. Sand country:** Overdrilling offers a valuable means of improving sand country which would suffer from wind erosion if the natural cover were removed.

**3. Drought stricken areas where good species have been burnt out.**

**4. Young pastures (2 to 4 years old) that have lost a good proportion of their grass, especially short-rotation, and have run to clover:** Work to date indicates the superiority of overdrilling in such cases.

**5. Older pastures (5 to 10 years) that have deteriorated and into which browntop has crept, but which have been regularly topdressed and have a good clover base:** On such pastures overdrilling can be quite successful after a dry autumn, provided it is done in time for the strike to come away with the autumn flush. On the other hand late overdrilling of such pastures is likely to fail. In a tough type of turf, especially where an appreciable amount of browntop or paspalum has invaded, the chances of success are greatly reduced. Especially is this so under moist, warm, and fertile conditions conducive to rapid pasture growth.

**6. Rape and chou moellier:** Under suitable conditions the overdrilling of these crops with a full pasture mixture has given good results. Further reference will be made to this aspect of overdrilling later.

**7. Lucerne stands:** The overdrilling of lucerne into an existing stand cannot be relied on to give worthwhile results and cannot be recommended. However, the overdrilling of old lucerne stands with either short-rotation ryegrass or a cereal (provided penetration is satisfactory) can give quite worthwhile results.

**8. Introducing cereals and root crops into pasture:** The few experiments done with the overdrilling of cereals (millet, oats, and barley) directly into pasture sward have not given encouraging results.

The cereals seem to suffer from competition from the existing pasture and are usually weak and unproductive. It is possible that more success might be achieved if the overdrilling implements were capable of greater penetration so that the seed and fertiliser could be placed to a depth of 1½in. to 2in.; that is, just below the surface root mat. However, there is no proof of this yet.

Very limited success has been obtained with the overdrilling of turnips. Though under very favourable conditions the results could possibly be worth while, the conditions that would favour turnips would also favour the introduction of grass and this would be a more worthwhile objective. Here the use of the chemical method to kill or greatly weaken the pasture before overdrilling would appear to be sounder. Work on this aspect of overdrilling is proceeding.

### Sward Competition

If overdrilling is to be successful, it must be thought about in the right way. A new method demands a new approach. In examining the results of overdrilling in different districts one is struck by the great variation in results obtained. Why, for instance, should overdrilling give such outstanding results under one set of circumstances and such poor results under another? Poor results in some cases could have been avoided if the operator had had a better understanding of the factors involved. In other cases the attempt was clearly outside the scope of overdrilling with present equipment.

Short-rotation ryegrass coming through in a clover-dominant, high-fertility pasture 3 weeks after sowing. Note the even strike.

The situation that arises when seed is sown on an existing sward should be considered. Unlike a prepared seed-bed for new grass, the existing sward is extremely variable. Overdrilling is normally done under conditions of ideal consolidation, and, in fact, an existing sward is infinitely superior in this respect to the majority of conventional seed-beds.

However, the vital difference is this: When a seed-bed is worked up the original pasture plants are destroyed and all competition from them is removed, with the result that the newly sown pasture plants are able to develop quite freely apart from the effects of volunteer weed growth. With overdrilling, on the other hand, seedlings with undeveloped root systems and foliage are forced to compete for their share of moisture, food, and light with mature plants.

The severity of this competition is in direct proportion to the vigour of the existing sward. This competition can at times be quite overpowering and result in the complete smother of the seedlings, even after the best of initial strikes. At the other end of the scale competition may be almost negligible, as, for example, when clover is sown on a cloverless sward.

The effects of competition can be greatly reduced by careful planning and management. This can be achieved through hard grazing before drilling, sowing at a time of the year when the sward is weakest, and subsequently managing the pasture to favour the establishment of the introduced species.

## Rate of Establishment

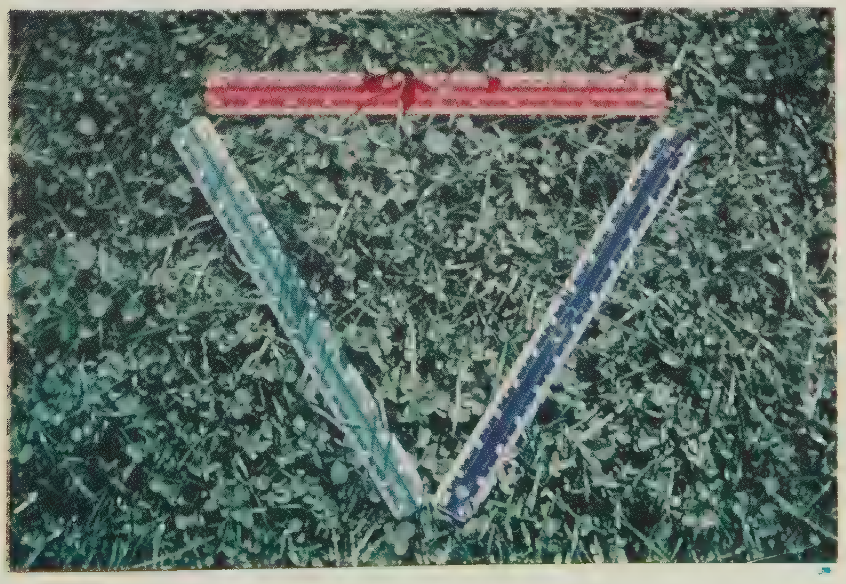
Rapidity of strike and establishment of the sown species are of vital importance in overdrilling, as these qualities have an important bearing on the capacity of the sown species to overcome the competition offered by the sward.

Annual species generally, such as Italian ryegrass and subterranean clover, are renowned for their rapid establishment. On the other hand, perennial species, such as perennial ryegrass and especially cocksfoot and timothy, are considerably slower. The last two are indeed so slow that they should not even be considered for overdrilling in high-fertility swards. Under very low fertility conditions or under extreme drought conditions, however, where the competition from the sward is negligible, cocksfoot has given fair results.

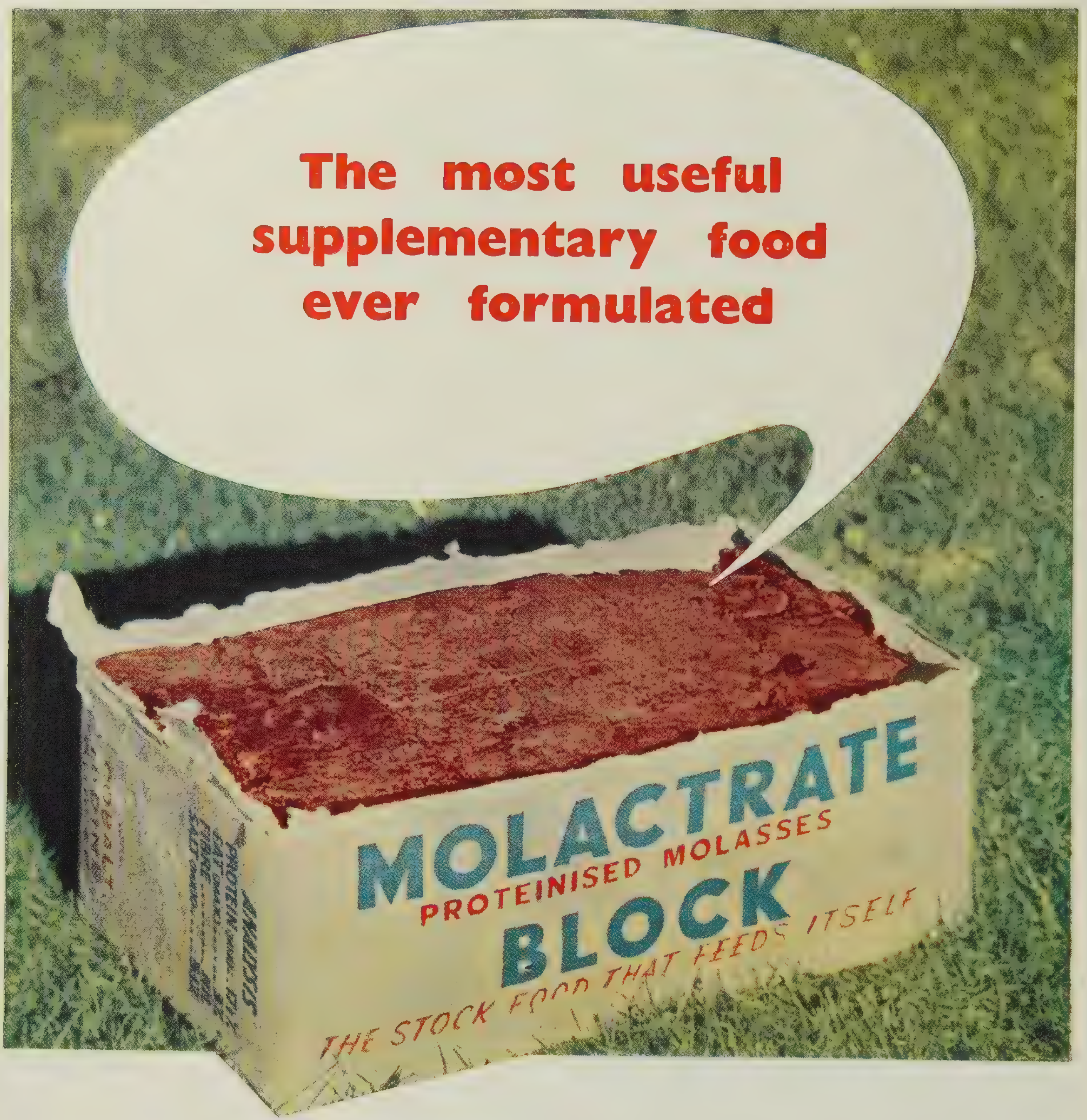
Short-rotation ryegrass, which is a cross between Italian and true perennial ryegrass, has inherited the rapid establishing qualities of its annual parent, and for this reason is an excellent grass for overdrilling under conditions of high fertility and clover dominance. Prairie grass is slower and more uncertain in its strike than short-rotation ryegrass, but once it has struck, it has a remarkable capacity to compete with existing pasture growth because of its great ability to climb to the light. The value of prairie grass for overdrilling has not been fully investigated, but where it is being tried care should be taken not to use new season's seed, as the germination is often poor.

As different species vary greatly in their striking and establishing rates so also do different lines of seed of the same species. Care should therefore be taken to buy seed that has not only a high germination capacity but also good vigour, as the latter quality determines the rate of strike and establishment. How can the farmer determine whether the seed he buys is a vigorous line or otherwise?

For every line of certified seed the Department of Agriculture issues a purity and germination certificate on which two separate percentage germination figures are given. One is the interim germination, for example, with ryegrass the percentage of seed which



Sward with a good balance of grass and clover. Unless there is a sufficient backing of grasses, much of the valuable nitrogen produced by the clovers cannot be used and is lost in drainage, especially over winter.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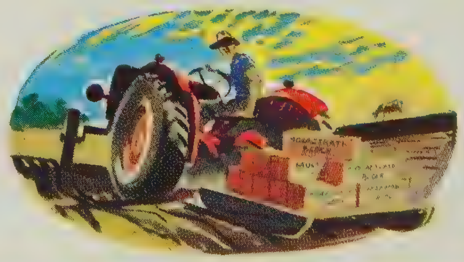

Prior hard grazing is an important factor in successful overdrilling. Here a paddock is being grazed off cleanly by stock controlled by an electric fence.

germinates in 6 days and the other is the final germination (with ryegrass the percentage germination is 12 days). For overdrilling it is the interim figure or the percentage of seed that germinates in the shortest time that counts. The more vigorous the existing sward is the more important becomes this ability of oversown species to germinate quickly.

### Introducing Clovers into Low-fertility, Virtually Cloverless Native Swards

**Pre-management:** The country should be grazed out hard before overdrilling.

**Time of sowing:** Much will depend on the climate. In the colder regions of the South Island, such as the Mackenzie Country, spring sowing is necessary because the danger of seedlings being killed by frost lift is too great with autumn sowings. In warmer areas autumn sowing is usually favoured, though spring sowing may also have a place.

**Subsequent treatment:** Grazing should be lenient. The harder the country is the more lenient grazing should be in the early stages of development. In the Mackenzie Country, for instance, clover sown in spring would not normally be grazed until autumn. Under such hard conditions early grazing would result in weakly plants and so greatly reduce their permanence. The guiding principle in hard country is to spell adequately during the development stages and to graze during this period only if the existing vegetation threatens to compete with the introduced plants.

### Introducing Grasses into Clover-dominant Pastures

The overdrilling of clover-dominant, high-fertility pastures with short-rotation ryegrass capitalises on the high nitrogen reserves built up in the soil by the clovers during summer and early autumn. These reserves are largely lost over winter through leaching if there is an insufficient backing of ryegrass in the pasture to keep these reserves of nitrogen in circulation. Further than this the established clovers supply additional nitrogen to the introduced grass early in spring. The significance of this was well demonstrated in the Massey College-Grasslands Division trial where the heavy surface cultivation destroyed practically all clover and resulted in marked symptoms of "spring yellows" from August onward.

These are the reasons an overdrilled pasture often outstrips a new pasture in growth during both winter and spring. Apart from these advantages, overdrilling enables the pastures to be used for autumn-saved feed without undue suppression of the clovers, and pugging by stock is much less of a problem than with new grass.

Considerable success has accompanied the overdrilling of clover-dominant, high-fertility swards with

# Contagious Abortion

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ryegrass and particularly with short-rotation ryegrass. On free soils and on pastures that are inclined to be open with little browntop, Yorkshire fog, etc., conditions are practically ideal. Attempting to introduce short-rotation ryegrass into swards of low fertility is courting failure and is bound to give disappointing results irrespective of whether the initial strike is good or indifferent.

### Pre-grazing Management

The sward should be grazed hard in preparation for overdrilling. The cleaner and harder the area is grazed the greater will be the chances of success.

On sheep farms heavy stocking over a period or successive hard grazings with big mobs is very effective. Such close grazing cannot be achieved on a dairy farm, but the usually more open nature of the bottom of dairy farm paddocks helps to make up for this. However, where a good sized mob of sheep can be brought in for the final cleaning up this should be done.

Surface cultivation is sometimes done before overdrilling with the object of further weakening the sward. This should not normally be necessary, however, for clover-dominant pastures. Vigorous white clover will survive a fair amount of surface working, but it must be stressed that undue clover damage can seriously affect subsequent production.

The surface of a tight sward is sometimes worked to further weaken it. However, the amount of cultivation necessary to weaken such a sward effectively often results in enough surface trash to affect seriously the operation of the machine. It must also be stressed that the value of overdrilling lies largely in the extent to which it can be used as a quick, once-over method. Where this principle is departed from and time-consuming surface cultivation is depended on as well, this important advantage is lost. It should be remembered also that cultivation of any kind encourages weed seeds to strike and establish.

### Time of Sowing

Sowing should be done as early in autumn as conditions will allow. In seasons when it is dry in late summer and early autumn overdrilling should be done immediately autumn rain has softened the ground enough to allow satisfactory penetration. It is very important not to delay sowing a day longer than is necessary at this stage, as the sward revives very rapidly; and if sowing is unduly delayed, the results are likely to be much poorer or there may be complete failure. Some remarkably good results have been obtained on free soils where satisfactory penetration has allowed sowing before a drought has broken. In a wet autumn, and in districts where droughts are less common at this time of the year, sowing should be done as early as possible and before the drop to lower temperatures in autumn initiates the change from clover to grass growth.

### Subsequent Management

Management after sowing can make or break an overdrilled pasture. The sole aim should be to encourage the establishing species. Where these are obviously asserting themselves over the pasture the paddock should under no circumstances be grazed. On the other hand, many a potentially good strike has been ruined by neglect to graze when circumstances warrant.

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If, therefore, the pasture shows signs of threatening the introduced species, grazing must be resorted to. The quickest way of smothering seedlings is to exclude light from them, and this is virtually what happens when the pasture leafage grows over them. Under these circumstances the top-hamper should be removed, by quickly and lightly grazing with a high concentration of stock, down to a level where the light can again strike the seedling leaves. This procedure should be repeated as often as is necessary.

In some circumstances grazing may be necessary immediately after sowing. This can be the case where pasture growth is too long at the time of sowing; or where growth is so rapid that it threatens to smother the establishing grasses. Such a practice though reasonably safe under dry soil conditions can be disastrous under moist soil conditions, because the sides of the furrows tend to be squeezed together and sealed over by hoof action. This greatly reduces the chances of success, because the seeds then have a much greater depth of soil to come through, and the united turf quickly knits together and so offers considerably more competition to the seedlings.

On the other hand, where conditions for overdrilling have been favourable and the introduced species are asserting themselves spelling the paddock for up to 6 weeks has everything in its favour. Such a practice falls into line admirably with the shutting up of pastures in autumn. Under these circumstances the clovers are not likely to suffer much for two important reasons. They are mature plants; and the introduced grasses have been sown in 7in. rows. Because of this the clovers suffer much less competition from the introduced grass and are free to grow in the inter-row spaces, where they can also receive a good share of the available light.

## Introducing Grasses and Clovers Together

As both the conditions required and the subsequent management for grasses and clovers are almost directly opposite it stands to reason that generally it is not good policy to try to oversow both species at the same time. It is better to establish the clovers first; then, when the fertility has been raised enough, to introduce the grasses.

However, there are exceptions to this rule. Under extreme drought conditions where a proportion of both species have been burnt out quite good results have been obtained by including both grass and clover in the mixture. It is of prime importance, however, to overdrill as soon after the drought as satisfactory penetration can be achieved. Subsequent grazing management should be similar to that for a new grass paddock; that is, on and off grazing with high stock concentration and grazing hard enough on each occasion to allow the light to reach the establishing clovers. Such treatment must be persisted with until the seedlings have developed to the stage where they can hold their own with the other pasture species.

## Introducing Clovers into Newly Sown Pastures

The two most pressing needs in introducing clovers into newly sown pastures are:—

1. **Reinforcing the clovers in a pasture where the initial establishment has been poor:** Under such circumstances the pasture soon weakens and becomes unthrifty through a deficiency of nitrogen. At this stage the clovers should be introduced. August or September is a suitable time to overdrill an autumn-sown pasture. The situation seldom arises with a spring-sown pasture, as the clovers almost invariably establish well at this time. The pasture should be hard grazed immediately before overdrilling. After the clover has struck, on and off grazing with high stock numbers should be practised. In the early stages the pasture should be kept down to the clovers to reduce competition to a minimum and allow the maximum light penetration. As the clovers establish the level of the grazing can be raised to draw the clovers up and become larger and stronger plants. Such a technique is especially advantageous to red clover establishment.
2. **Re-introducing red clover into high-fertility dairy pastures:** As unfortunately very little work has been done on this aspect of overdrilling, no specific recommendations can be made. A practical difficulty is that such pastures are usually strip grazed in spring, which is the logical time to attempt re-introduction, and pasture recovery is usually very rapid. Some farmers include about a pound of red clover with their overdrilled short-rotation ryegrass in autumn and claim that enough clover survives to warrant the practice.

## Overdrilling Rape and Chou Moellier Stubble with Pasture Mixtures

Where chou moellier has been cleanly fed off and the crop has been dense enough to exclude weed growth, pasture mixtures can be drilled straight into chou moellier stubble without prior cultivation. A disc drill is the most suitable implement for this purpose. The method results in a worthwhile saving of time and cost and can result in much earlier pasture establishment than is possible by conventional methods, especially where dry conditions follow sowing. The reasons for this are that much of the soil moisture is lost during cultivation and the necessary consolidation for sowing down usually cannot be achieved until sufficient rain has fallen. The pasture also reaps the benefit of the surface fertility build-up left by the stock.

Though rape stubble can also be overdrilled in this way, excellent results are often obtained by cleaning off the stubble with ewes and cattle, surface working to create a top tilth, and broadcasting the seed. Sheep are sometimes used to trample the seed in. However, where rape cannot be fed off hard enough or time does not permit cultivation, overdrilling can be a convenient solution, provided the area is practically free from weeds.

The method is, however, suitable only for flat or easy paddocks, because cross-drilling is essential for worthwhile results. The paddock should be drilled one way with half the seed and then cross-drilled at an angle of about 30 degrees with the remainder. Cross-drilling greatly improves the surface cover and favours clover establishment.

The method can give quite good results under suitable circumstances. However, as with any “catch” method it has limitations which must be recognised.

## Rates of Seeding

Specific information on rates for overdrilling clovers and grasses cannot be given, as these will vary according to circumstances. Information should be sought from the nearest office of the Department of Agriculture. It has been found, however, that from 7lb. to 8lb. per acre of good-germinating short-rotation ryegrass is sufficient, under suitable conditions for overdrilling, to restore fully a pasture that has lost practically its entire grass fraction.

Reference has previously been made to the importance of buying seed with a high interim germination.

## Covering the Seed

Under dry or almost dry soil conditions where the dislodged turf is free enough to shake out, an improved cover of the seed can be obtained by attaching harrows directly to the drill. Under half-dry conditions, however, it has been found an advantage to harrow some hours later, as a separate operation, when the dislodged turf has had time to dry enough to shake out with the harrows. This results in a better all-round “dust in” of the seed. Under moist soil conditions there is little or no advantage in harrowing.

(To be continued)

# Correspondence Courses in Agriculture

CORRESPONDENCE courses in agricultural subjects are provided by the two correspondence schools of the Department of Education in Wellington for students in any part of New Zealand who cannot attend day or evening classes in their locality. These schools are the Correspondence School and the Technical Correspondence School.

**THE Correspondence School** provides post-primary courses in agriculture up to School Certificate standard for both full-time and part-time pupils. Applicants for courses who have had no agricultural experience or have not previously studied agricultural subjects should apply for one of the introductory courses listed as available from the Correspondence School. Further information may be obtained from the Headmaster, Correspondence School, Clifton Terrace, Wellington.

**The Technical Correspondence School** provides courses of a practical and applied nature for part-time students engaged in agricultural or horticultural work. Details may be obtained from the Principal, Technical Correspondence School, Buckle Street, Wellington.

Free post-primary education for 5 years or until the end of the year in which he or she reaches the age of 19 (whichever is the longer) is granted to every person in New Zealand. Applicants for correspondence courses who have not completed a 5-year period of free post-primary education are therefore entitled to receive their courses free until they have completed that period. Students who already have had 5 years' free post-primary education have to pay fees for courses at both correspondence schools, but these fees are low and text-books may be hired.

## Correspondence School Courses

### Farm Practice

A 1-year course dealing briefly with the more important branches of New Zealand's agriculture. This course is used as an introduction to the agricultural subjects of School Certificate, but it is also suitable for general study by pupils and adults interested in farming in New Zealand.

### School Certificate Subjects

**General agriculture.** A 2-year course covering how a plant grows, seed certification; soils, fertilisers, and manures; crops and pastures; the main types of plant and animal life of interest to the farmer.

**Animal husbandry.** A 2-year course covering the cow, pig, horse, and sheep; principal breeds; current economic problems in stock farming; wool; pastures and their management; supplementary crops; genetics; physiology and diseases.

**Dairying.** A 2-year course covering milk, cream, butter, and cheese; their production and distribution; herd testing and improvement; care and management of cattle; use of dairy products.

**Biology.** A 2-year course covering the form and function of plants and animals in relation to their environments.

**Horticulture.** A 2-year course covering plant form, function, and growth in relation to gardening matters.

The School Certificate subjects may also be taken for general knowledge by non-examination pupils. Any number of the above courses can be studied at the same time and provision is made for both written and practical work.

### Subjects for Junior Examination of National Diploma of Horticulture

Chemistry.
Bookkeeping.

## Technical Correspondence School Courses

### Agriculture

**Dairy Farming**

The course provides a knowledge of the breeding, rearing, and general management of dairy stock under the grassland system of farming practised in New Zealand.

Consideration is given to soil and fertilisers, pasture management, farm layout, shed construction, sharemilking, valuing and purchasing farms, and pig husbandry.

**Sheep Farming**

The course covers principles of breeding, growth and development, nutrition, pasture management, wool, wool types, factors affecting wool production, and preparation of the wool clip.

**Arable Farming**

The course deals with the general characteristics of arable farming, crops and cropping, stock policy, management of pastures and equipment, budgeting, and the yearly cycle of operations.

### Horticulture

**Courses for the Junior, Intermediate, and National Diploma Examinations of the Royal New Zealand Institute of Horticulture**

Horticultural botany.
Principles of botanical classification.
Principles of plant protection.
Principles of horticulture.
Practice of horticulture.

**Certificate in Vegetable Culture**

Course for those engaged in market vegetable production.

**Courses for Horticultural Apprentices**

General horticulture.
Horticultural botany.

### Dairy Manufacture

The purpose of the courses in dairy manufacture is to offer workers in the dairy industry theoretical instruction in butter and cheese manufacture and to provide the necessary tuition for those who wish to enter as candidates for the Dairy Factory Managers' Registration Board examination.

The courses give instruction in the following subjects:—

Buttermaking.
Cheesemaking.
Dairy factory management.

### Rural Valuation

Courses in the following subjects of the professional examination of the New Zealand Institute of Valuers are available.

Field husbandry.
Animal husbandry.
Surveying, levelling and drainage.
Rural valuation law and farm economics.

### Short Courses

Short courses are available in the following subjects:—

Milk.
Concrete for the home and the farm.
Farm bookkeeping.
Fruit growing.
Practical horticulture.
Introduction to forestry.
Vegetable growing.

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# Radio Broadcasts

RADIO broadcasts for farmers will be given during February as follows:—

**1XH Hamilton, 12.33 p.m.**

10 February—"Facial Eczema", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

17 February—"Hill Country Problems", by J. D. Currie, Instructor in Agriculture, Department of Agriculture, Hamilton.

24 February—"Problems of Dairy Farmers", by W. Petersen, Federated Farmers, Hamilton.

**1YZ Rotorua, 7.15 p.m.**

5 March—"Off-season Improvements in Farm Dairy Premises", by E. P. Carter, Special Inspector, Dairy Division, Department of Agriculture, Hamilton.

19 March—"Rendering of Bee Combs for Wax", by D. B. Briscoe, Apiary Instructor, Department of Agriculture, Tauranga.

**2ZA Palmerston North, 12.33 p.m.**

3 February—"Incidence of Ectoparasites on Stock and their Control", by H. A. Collett, Veterinarian, Department of Agriculture, Palmerston North.

10 February—"Overdrilling of Pasture", by L. W. Blackmore, Instructor in Agriculture, Department of Agriculture, Dannevirke.

17 February—"Inspection Requirements for Export Potatoes", by T. N. Flint, Plant Quarantine Officer, Department of Agriculture, Palmerston North.

24 February—"Hay Barn Construction", by R. G. Burton, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

**Regular Sessions**

**1XH Hamilton**, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

**1XN Whangarei**, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m.

**1YA Auckland**, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m., and Fridays at 6 p.m. and 7.45 p.m.

**1YZ Rotorua**, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month at 12.33 p.m.), Thursdays at 12.33 p.m.

**2XA Wanganui**, Wednesdays at 8 p.m. (stock sale report), Thursdays at 8 p.m.

**2XG Gisborne**, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

**2XN Nelson**, Thursdays at 8 p.m.

**2XP New Plymouth**, Thursdays at 8.1 p.m.

**2YA Wellington**, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

**2YZ Napier**, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

**2ZA Palmerston North**, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

**3XC Timaru**, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

**3YA Christchurch**, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

**3YZ Greymouth**, Mondays and Thursdays at 12.33 p.m.

**4YA Dunedin**, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m. and 6.50 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

**4YZ Invercargill**, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m. and 7.15 p.m. (Lorneville and Gore stock market reports), Wednesdays at 12.33 p.m., Thursdays at 12.33 p.m.

# WORK IN THE HOME GARDEN IN FEBRUARY

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

THOUGH the less interested gardener may have lost much of his early season interest in garden work by February, the keen gardener has new interests and sources of pride in his work. The growing of half-hardy and tender plants, such as tender beans, capsicums or peppers, cucumbers, egg plants, melons, marrows, pumpkins, sweet corn, tomatoes, and yams, most of which can be grown and brought into bearing only during a comparatively short period during the warmer months, presents a challenge to his skill; the harvesting of the fruits of such plants usually provides a source of pride in achievement.

THE aim of the efficient gardener should be continuity of supply, within the limits set by the size of the garden, with special emphasis on having crops in bearing when vegetables are usually scarce and dear, together with the maintenance of good soil texture, consistently heavy yields of quality produce, tidiness, and freedom from pests and disease.

Few gardens lack vegetables in February, but if the growth of vegetables is good, so too is weed growth. Apart from making sowings and plantings which will develop during favourable autumn weather, the most important job in most gardens is to destroy weeds, which, if left, will suppress all but the most vigorous or mature crop plants.

Many weeds produce seed in February, and reinfestations from this source may be troublesome throughout the year. Many weeds are alternate hosts for vegetable pests and diseases and help to carry them over from one season to the next.

In most districts a sowing of cabbage and cauliflower for spring use can be made. Seed of salad crops, such as lettuce, spring onions, radish, mustard, cress, endive, and other crops, such as turnips, beetroot, spinach, and silver beet, can be sown where soil conditions are good and the weather is likely to remain favourable long enough to enable the plants to mature. Small sowings of dwarf beans, peas, and carrots can be made in favourable situations, particularly in the warmer districts.

Kumara runners should be lifted to prevent their rooting, and tall-growing tomato plants should be pruned and tied. Celery and celeriac should be kept well supplied with moisture. Celery can be set out in favourable situations. Brassica crops should be sprayed or dusted to prevent attack by pests. In many districts tomatoes and potatoes will have to be sprayed or dusted as a precaution against pests and diseases.

Though there are some variations according to district and situation, there are usually only four good growing months after Christmas. With garden work so often disrupted by the Christmas and New Year holidays many gardens are neglected during the greater part of January and important garden work is delayed until February. This loss of one of the best growing months may seriously reduce the period for good growth in southern districts, particularly of winter greens, which include leeks, savoy cabbage, winter cauliflower (broccoli), kale, brussels sprouts, and silver beet.

Winter greens should be regarded by home gardeners as among the most important crops in the garden as, with forethought, they can be grown so that produce can be harvested from them from late autumn until late spring, when vegetables are most likely to be scarce and dear.

As it is late in most southern districts and the less favourably situated gardens elsewhere for the setting out of winter greens, they should be planted without delay, if this work has not yet been done. Success, apart from weather, will depend largely on soil fertility and the use of healthy, well-grown plants.

## Beetroot and Carrots

In most districts February provides the final opportunity for sowing beetroot and carrots to mature before winter. Late sowings of carrots are sometimes less subject to the attack of carrot aphids and the carrot rust

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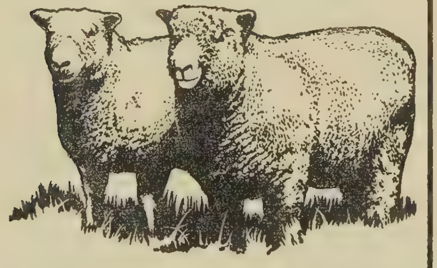

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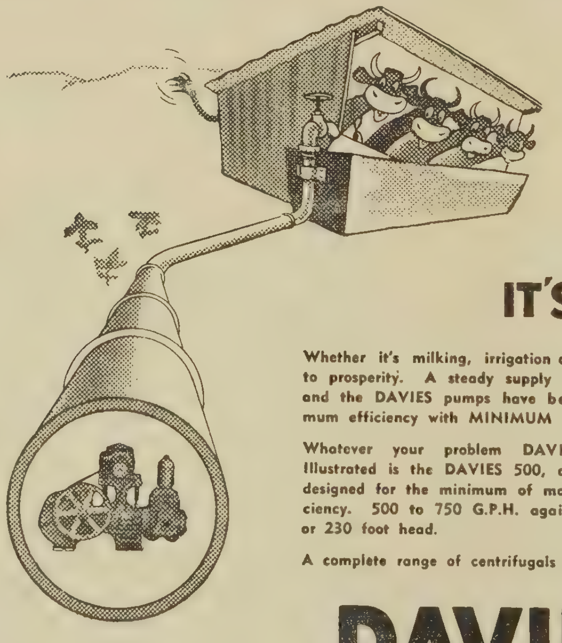

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fly and are therefore preferred in some districts. In southern districts the situation and autumn weather must be favourable if late crops are to be satisfactory. The seed must be sown without delay in soil that is in good condition and worked to a fine tilth.

The situation should be sunny and open, as these root crops rarely thrive if shaded, even if soil conditions are otherwise perfect. Beetroot and carrots are not difficult to grow, but soil must be friable, moist, and well drained and the plants must be kept free from insect pests. Light, sandy loams are most satisfactory and produce the smoothest and straightest carrots, but all good loams apart from the heavier clay loams can be improved to produce satisfactory crops.

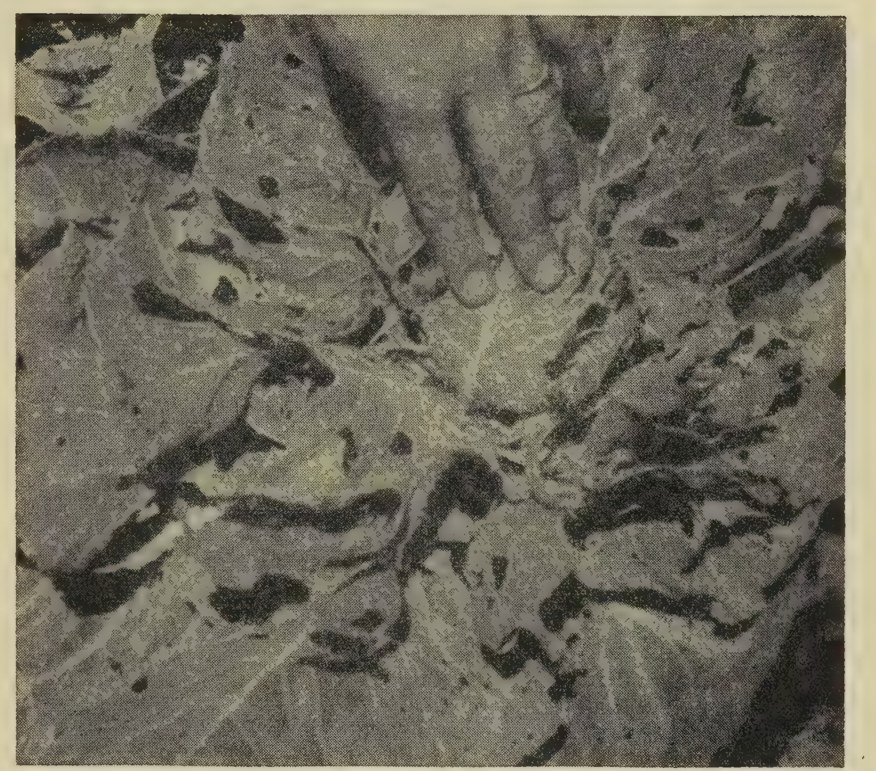
Difficulty is commonly experienced by home gardeners in growing carrots and beetroot in the older, sometimes rather light soils that have been worked for many years without having had much organic matter such as compost or farmyard manure applied to them. Trouble is commonest in the smaller garden where cropping is usually continuous and good crop rotation with adequate green cropping is difficult.

Carrots and beetroot grow well in soils that were heavily dressed with organic manure for the previous crop. The application of heavy dressings of organic manure just before sowing is not advised, though results may be satisfactory if the manure is well rotted and mixed throughout the root area. The incorporation of lumpy masses of fresh or only partly rotted manure is especially to be avoided, as local conditions may become highly acid and the carrots coming in contact with the manure may become forked or distorted.

### Varieties

Good varieties of carrots for home garden use include Red Cored Chantenay and Taranaki Strong Top. Sweet Crop is a variety which has attracted a good deal of interest among home gardeners. It is a selection of Holmes Improved developed by the Crop Research Division of the Department of Scientific and Industrial Research. It is smaller than the original Holmes Improved, but retains the same characteristic sweetness. Generally, its colour is poor and it develops objectionable green shoulders, which may protrude up to 2in. above the soil surface unless the soil is drawn up to the plants.

Detroit Dark Red is one of the most popular varieties of beetroot, but Early Wonder, which is a heavy yielder and matures 8 or 9 days before Detroit Dark Red grown under similar conditions, should be more suitable for a late sowing, particularly where the season for it to develop is limited. Early Wonder is semi-globe shaped with a smooth skin, good flesh texture, and a fine taproot with a strong top.



*[Green and Hahn*

Cabbage caterpillars can be very destructive at this time of the year. They can readily be controlled by spraying or dusting with DDT or lindane.

### Soil Preparation

Soil preparation for the seed-bed should be thorough. Lumpy soil should be pulverised until a fine tilth is obtained.

Results are likely to be better on most soils if mineral fertiliser is used to supplement the organic manure in the soil. A complete fertiliser—one made up of nitrogen, phosphate, and potash—is likely to give best results on most soils, but good responses are obtained on many New Zealand soils from superphosphate alone. Superphosphate can be worked in at the rate of about 2oz. to 3oz. to the square yard during the final cultivation.

Carrot seed is rather small and should be sown only ¼in. deep in rows 12in. to 15in. apart at the rate of about 15 to 20 seeds to each running foot of row. On soils that tend to form a crust after rain the soil over the seed should be kept hoed to break the crust and to facilitate the emergence of the tiny seed shoots.

Soil and manurial requirements for beetroot are similar to those for carrots. Seed should be sown ½in. deep, about 10 to 15 seeds to the running foot, in rows 12 to 15in. apart. Plants should be thinned to 2in. to 3in. apart as soon as they can be handled.

### Control of Aphids

Aphids or green fly are commonly the most troublesome pests on carrots and home gardeners sometimes have difficulty in detecting them. The plants should be examined regularly from the seedling stage so that spraying can be begun as soon as the aphids appear. Usually the first and most readily noticeable sign of aphids is the presence on the carrot foliage of tiny whitish or greyish flecks rather like cigarette ash which are the cast-off skins of the aphids.

When the plants are young just a few aphids soon sap their vigour, and in warm weather the leaves even of large plants quickly lose turgidity. If infestation is heavy, the plants become flaccid and growth may cease.

Aphids can be controlled by spraying on a warm, still day with nicotine sulphate 1 fl. oz. (approximately 7 teaspoons) to 5 gallons of water, plus a little soap or lime to activate the nicotine. Alternatively, lindane can be used.

## Spring Cabbage

Cabbage is one of the most valuable garden vegetables, as it is not only nutritious but grows well in a wide range of soils and in good conditions is one of the heaviest yielding crops.

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# THE JOURNAL OF THE BRITISH GRASSLAND SOCIETY

Editor: A. G. G. HILL

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Root crops such as beetroot can still be sown in districts which have a fairly long autumn.

Though in northern districts or in sheltered situations spring cabbage can be grown from seed sown in March, February is the preferred month for sowing. Where soil and situation are not good seed should be sown as soon after the end of January as possible.

Seed of spring cabbage is not usually sown before the end of January, because if seedlings are set out too early, plants mature too quickly. If seed is sown early and plants are left in the seed-bed until the usual setting out time, they may become too large to transplant well. Very large plants set out where winter temperatures are low are very liable to run to seed.

Though cabbage is a cool-climate vegetable, seed germinates and plants grow well in a fairly wide range of temperatures if the physical condition of the soil is good and it contains adequate moisture and plant nutrients.

### Varieties

Flower of Spring, Enfield Market, and Triumph are among the best and most commonly grown varieties of spring cabbage, except in some northern parts of the North Island, where Jersey Wakefield and the summer cabbages Green Acre and Golden Acre are also favoured.

Several other good varieties are listed in most catalogues. For the home gardener who has sufficient ground and is interested in improving his crop a trial of a different variety is well worth while. It may specially suit his conditions and even if it is not an improvement, it may mature at a different period and contribute to the continuity of his supply.

## Cucumbers, Marrows, Melons, and Pumpkins

As long as the soil is not permitted to dry out cucumbers, pumpkins, marrows, and other members of the cucurbit family, such as melons, usually require very little attention at this time of year. Once marrows and pumpkins are properly established and good laterals are developing it should not be necessary to pinch back or stop the leading growths unless they are invading a neighbour's garden or ground reserved for another crop. Shoots of trailing varieties can be trained in the desired directions by driving short sticks on either side of the stems at intervals of 1ft. to 2ft.

If growing conditions are good and the surface soil is kept moist and is well drained, the trailers of some varieties sometimes root in the soil. This is a desirable feature, because it increases the weight of crop. Pegging encourages rooting and also prevents trailers from being blown about by strong winds.

The fruit of marrows should be cut when young, preferably before the skin hardens to the extent that it cannot be broken easily by the thumb nail; 10in. to 12in. is a good size, as larger marrows usually have less flavour than smaller ones.

Early cutting of the fruit encourages the development of later ones. It is inadvisable to allow fruit to reach full maturity, unless it is intended to grow mammoth specimens or to store fruit for winter. They store quite well and like pumpkins and squash, which should also be allowed to mature fully if they are to be stored, should be harvested carefully without being subjected to even slight frosts and stored under perfectly dry, frost-free conditions.

Cucumbers are more tender than tomatoes or sweet corn and as the leaves are readily scorched by sun or wind in exposed situations, they should be grown between rows of taller plants, such as peas or sweet corn, which will provide some shelter. The fruits should be harvested before fully mature.

Cucurbits often become infested with aphids or green fly. In warm weather aphids multiply rapidly and unless checked they soon damage the plants. Some species of aphids exude a sticky substance on which a sooty mould grows, which makes the plant unsightly. Aphids also cause the leaves to curl and become distorted; the fruit and flowers, too, may become deformed. Frequently aphids transmit virus diseases which may cause serious reduction in yield or even the death of the plants. Aphids can be controlled as advised for carrots.

## Kumaras

Kumara runners should be lifted periodically to prevent them from rooting. If they are lifted regularly, the vines will not mat together and are much easier to turn. The commercial culture of kumaras is confined to the northern parts of New Zealand, though they can in some seasons be grown in warm, sheltered areas as far south as Christchurch.

## Onion Harvesting

Correct harvesting has an important bearing on the keeping quality of onions, most of which are harvested

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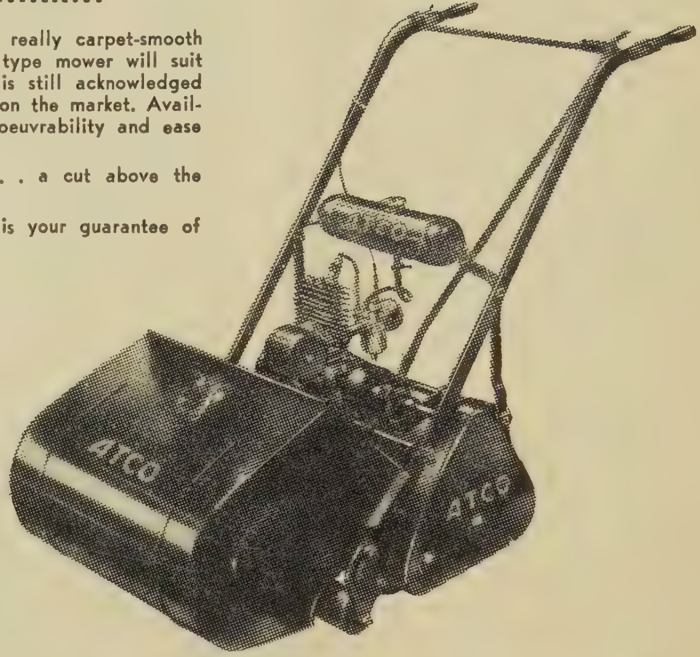

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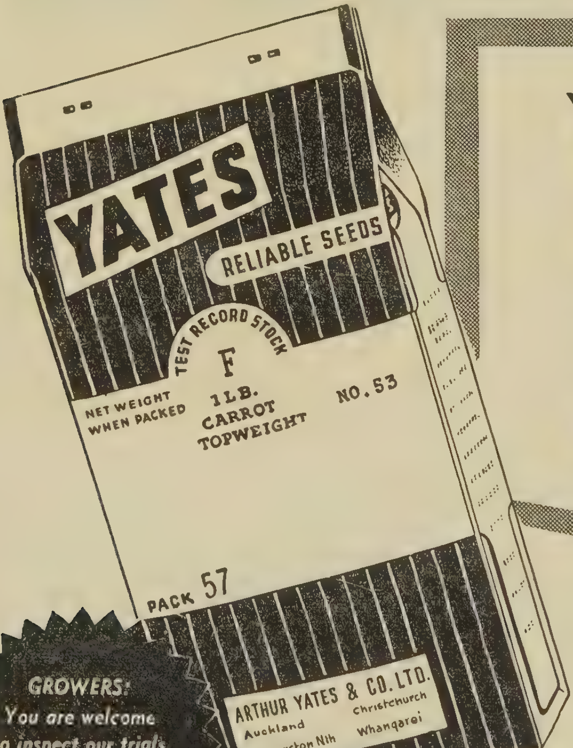
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in February and March. The most suitable time should be determined by factors such as the weather, the condition of the crop, and whether the onions are for fairly immediate use or for long keeping.

If bulbs are to be used almost immediately, they should be lifted as required when they have reached maximum or nearly maximum growth. If they are for long keeping, it is desirable that they should be cured. In this condition the roots and tops should be dried off and the bulbs should be so hard that they are not readily dented by the thumb.

Readiness of onions for harvesting is indicated by drooping of the tops just above the bulbs while the leaves are still green. Gradual dying back from the tops of the leaves while the necks remain rigid, erect, and thick is an indication of abnormal ripening and usually of poor keeping quality. Insect pests or heredity may be responsible. There is likely to be a percentage of this type in practically all crops.

The roots of healthy well-grown onions ready or nearly ready for harvesting lose their hold on the ground as they gradually die and the necks soften. This results from transference of the soluble solids of the leaves into the bulbs until the outer succulent layers of the bulb nearly close the opening on the inner scales. After the necks shrivel the leaves gradually turn yellow and dry off, even if the onion is not harvested.

If the onion bulbs dry off prematurely, the necks of the bulbs may remain open and allow various organisms which cause rots to enter. Premature drying off of the bulbs may be due to injury by heavy infestations of thrips or by damage to the roots by hoeing, though growers sometimes hoe off the roots to cause premature death of the leaves and thus speed the drying off of the crop so that harvesting can proceed.

Except in a few areas conditions in New Zealand are rarely ideal for harvesting onions and it may not be possible to wait until the crop reaches the best stage for harvesting. Early frost is a risk in some districts. Light frosts do not harm onions, but heavy frost may cause severe injury.

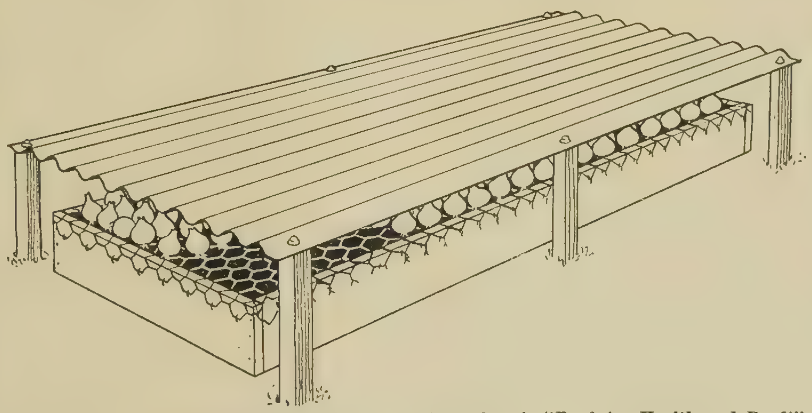
Onions with thick necks or that have not closed at the neck or bulbs left to dry that have been subjected to showers or to heavy dews are likely either to rot or take root again. Where conditions for drying are not likely to be suitable onions should be dried or cured under cover.

Drying or curing usually takes 3 to 4 weeks. In the lower-rainfall districts where a spell of fine weather in autumn is likely bulbs can be left on the ground. The tops should be left on to give them some protection from the sun. If rain falls or there are heavy dews, they should be turned to enable them to dry evenly and to check rots, sprouting, or discoloration by the wet soil.

After drying it is usual, though not essential, to top onions by cutting or twisting the tops ¾in. from the bulbs. Twisting is preferable, as it closes the top of the bulb and the twisted leaves act as a barrier to the entry of rot-producing organisms. Alternatively, the bulbs can simply be gathered when dry and packed in open-mesh bags or in shallow open boxes.

Though more space is needed for untrimmed onions, the tops are useful for cushioning the bulbs during handling and also in retarding the progress of rots that may develop. Where weather conditions are not favourable for curing in the field or where varieties, such as some of the white onions, that are difficult to cure are grown it is advisable to dry the bulbs in an airy shed or on a shelter such as that shown below before they are stored in open-mesh bags or boxes.

Where time can be spared stringing the onions as illustrated at right is an excellent method of handling the crop.



*[From the British Ministry of Agriculture's "Food for Health and Profit"*

**Drying frame for onions. Sun shining on the corrugated iron circulates warm, dry air about the onions set out on wire netting stretched on a frame about 3in. below the iron.**

*[Photo News*

**Stringing onions is a good way to keep them.**

## Peas

Garden peas can still be sown in favourable northern districts. In most southern districts it is rather late for peas sown even early in February to mature before winter. Except in the warmer districts sowing should be confined to sheltered situations lying well to the sun where the soil is well drained and in good condition.

An early or quick-maturing variety should be chosen. In favourable

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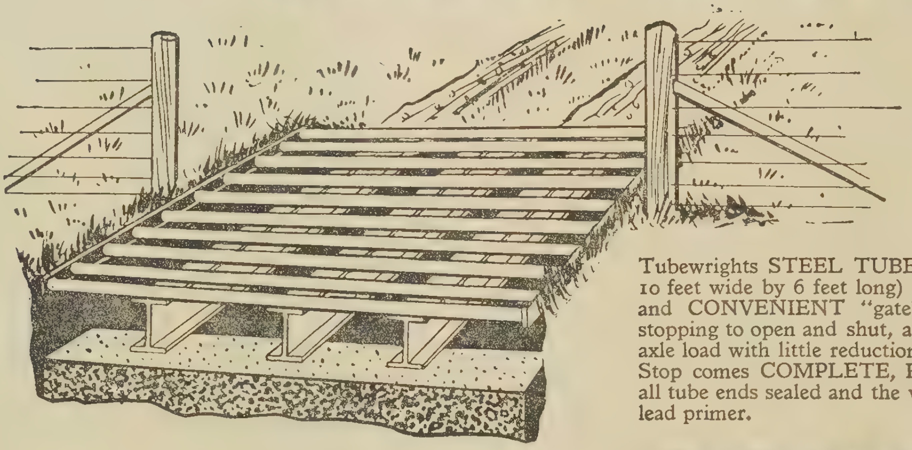

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NEW ZEALAND RAILWAYS

northern districts early maturing peas can be sown usually until about the middle of the month, but elsewhere they will have to be sown early in February.

Peas are hardy and grow well in cool, but not cold, weather. They are one of the best crops for soil improvement, as they leave a considerable weight of organic matter in the soil that is specially valuable because of the nitrogen gathered from the air which the peas fix in the nodules of their roots.

A contributing factor to the failure which sometimes occurs when peas are grown for the first time on some of the drier soils lacking organic matter is an insufficiency of the nitrogen-fixing bacteria needed by them. Garden peas grow in association with the same kind of nitrogen-fixing bacteria as broad beans, lentils, sweet peas, and field peas, though it is likely that there are many strains of the bacteria, some better adapted to certain crops than others.

### Manures

In fertile soils peas do not need heavy fertiliser dressings and on commercial crops, both in New Zealand and overseas, a very moderate dressing of superphosphate alone has given good results on a wide range of soils. Garden peas are fairly tolerant of soil acidity and usually grow well in fairly acid soils, but moderate applications of lime, about 3oz. to 4oz. to the square yard, are advisable on the more acid soils.

Injury often results where fertiliser is applied in the drills with the seed. It is best applied to the soil 2in. to 3in. on either side of the seed row or at least 1in. under the seed. The fertiliser can be applied in a drill taken out with a hoe and partly filled in before the seed is sown.

Peas repay soil-improvement measures. Deep digging of heavy soils and the incorporation throughout the soil area of moderate quantities of well-rotted organic matter are advised. Surface or near-surface applications not only are liable to cause seed injury but may encourage shallow rooting, which is specially to be avoided where conditions are liable to become dry.

A supply of nitrogen in the soil helps young plants to become established, but most soils that have been kept in good condition by regular dressings of well-rotted organic matter should be adequately supplied. On most home garden soils superphosphate alone at 1oz. to 3oz. to the square yard is likely to give satisfactory results.

### Seed Sowing

Seed can be sown at about 10 to 15 seeds per running foot in drills taken out with the corner of the blade of a chop hoe, or a broad drill can be formed with the chop hoe or spade and the peas sown 1in. to 2in. apart throughout it.

Seeds should be sown about 1in. deep except in the lighter soils that dry out readily, where they can be covered to a depth of 1½in. to 2in. If the drills are taken out a little deeper, when part of the covering soil is put back, the hollow left will serve to mark the row and facilitate watering. Later the peas can be earthed up to keep the roots cooler and to hold the plants more firmly in windy weather.

For dwarf varieties rows should be at least 18in. apart. Good, quick-maturing varieties for sowing in early autumn include William Massey and Little Marvel.

Pea crops coming into bearing should be watered if conditions are dry. On soils that dry out quickly a mulch of lawn clippings or similar material may be of value. Though peas grow best in moist, well-drained soil, it is not usually advisable to water the soil after sowing until the plants are well established, as germination losses are usually much heavier in wet soils.

### Sweet Corn

The first heads of sweet corn mature in many gardens toward the end of January or in early February. Sweet corn is not a hardy vegetable; it thrives in warm, sunny conditions, and within limits the higher the temperature is and the more sunlight it receives the more likely it is to succeed. It can be grown in most districts in New Zealand, as it is less sensitive to cold than either the tomato or the snap bean, but it is not much grown in gardens in far southern districts. Sweet corn is not specially sensitive to drought and usually bears earlier on light, sandy, or peat soils.

Suckers often develop at the bases of plants during January and February and home gardeners sometimes remove them in an effort to encourage early development of the cobs and to increase their size, but usually the practice is more likely to result in loss than gain. Removal of large suckers results in loss of plant tissue which is capable of converting plant nutrients into substances which help to develop the cobs. It may also result in serious plant damage.

Sweet corn is at its best for only a short time, especially with early varieties. Cobs should be harvested in the milk stage while they are plump, juicy, and firm and the silk is fairly dry. The cob can be tested by pressing the thumb nail into one of the kernels. If a milky substance is forced out, the cob is suitable for harvesting; if a doughy substance comes out, the corn is usually considered over-ripe.

As corn passes from the milk stage to the dough stage its sugar content decreases and its starch content increases. After cobs are harvested similar changes occur, the rate of change increasing as the temperature at which the cobs are stored increases. For those who appreciate corn at its best that is a good reason for growing corn in the home garden rather than buying it. If corn is not to be used soon after harvesting, it is best cooled and held at as near freezing point as possible, as then loss of sugar content is greatly retarded.

[*Green and Hahn*

Leeks should be given all the necessary attention to keep them growing well during autumn.

Home gardeners used to grow corn on mounds or "hills", but it is now generally agreed that there is little justification for the practice, as the raised soil surface about the corn tends to shed rain and makes watering difficult. Earthing up the stems of tall varieties is justified where winds are boisterous and the plants are not firmly established. It is a good plan, however, to grow corn in clumps, as corn is wind pollinated and pollen distribution is best where the plants stand in blocks.

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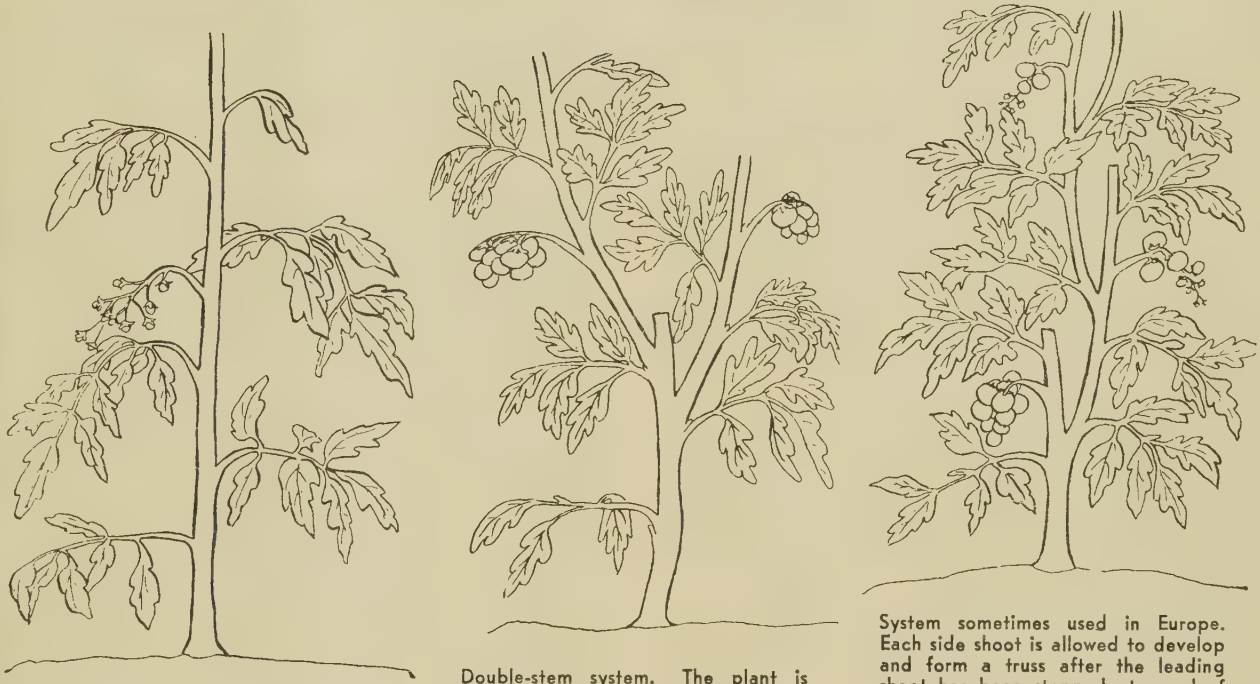
**Systems of Pruning Tomato Plants**



Single-stem system. All side shoots are removed.

Double-stem system. The plant is stopped and all side shoots are removed after the first two have been allowed to form the main stems.

System sometimes used in Europe. Each side shoot is allowed to develop and form a truss after the leading shoot has been stopped at one leaf above it. This is done progressively so that all fruit after the first truss is borne on stopped side shoots which in their turn become leading shoots.

## Tomatoes

Spraying, pruning, and tying of tomatoes should be continued as required. Where growth is very strong and the fruit is setting and developing well yet ripening too slowly, partly because it is shaded by foliage, cutting back of the covering foliage up to the nearly mature fruit with a sharp, clean knife is sometimes desirable. Spraying is then easier and the likelihood of infection from some diseases is less because of improved air circulation and reduced humidity.

In districts where potato blight, looper caterpillars, and stem-borer caterpillars are troublesome, plants should be sprayed with bordeaux or a suitable Government-certified substitute against potato blight and with DDT to control caterpillars. Because of possible danger from residue of DDT spray on ripe fruit it should not be used later than a fortnight before harvesting. Derris can be used in place of it.

Tall varieties of tomatoes which need pruning and such support as strings, wires, or stakes are widely grown outdoors in New Zealand, as well as under glass, though under more favourable conditions overseas it has been shown in a number of trials that tomatoes yield heaviest if they are not pruned.

Pruning is mainly carried out to obtain a comparatively heavy yield of fruit quickly where the season most favourable for growth is limited. Under hotter and more consistently favourable climatic conditions of longer duration unpruned tomato plants, if given the space and if grown in good soil, can usually be relied on to produce heavier crops of better-quality fruit with less trouble from physiological diseases, such as blossom-end rot, than pruned plants.

Under the conditions prevailing in most of New Zealand, however, pruning of the taller varieties is advisable to obtain the maximum yield in the season available.

Tall varieties are usually grown on the single-stem system (side shoots are removed as they develop). Under glass they are usually supported by strings suspended from overhead wires. Outdoor plants may be staked or supported against a wall or on wires between posts.

The two-stem system is favoured in some districts. The first side shoot is allowed to develop into a main stem and thereafter all shoots are removed as they develop, or the plant is allowed to develop 3 leaves and the top leaf or shoot is cut off so that the two side shoots that are allowed to develop below in the axils of the leaves will be of approximately equal strength. Some experimental work has shown that the root systems of plants with two stems are usually stronger than those of plants grown on single stems. Plants to be trained with two stems must be set out further apart than those to be kept to a single stem.

In France a modified system of pruning is sometimes used which it is claimed gives 10 days' earlier ripening of the first truss than with the orthodox, single-stem method. Under this system the main shoot is nipped out one leaf beyond the first truss. The highest side shoot below the truss is allowed to develop, and when it develops a truss it in turn is nipped out one leaf beyond the truss. Subsequently, the next highest shoot below that truss is allowed to develop and is nipped out one leaf beyond its first truss, and the process repeated for each truss.

# Care of Livestock during February

Contributed by the Animal Research Division

### PREPARATIONS FOR TUPPING

IF ewes have been held on short pasture since weaning, they should now be in good, hard condition. About 21 days before tupping they should be crutched and given the best pasture available. Experiments at the Department of Agriculture's Ruakura Animal Research Station have shown that flushing ewes for 3 weeks before tupping and keeping them on good pasture for 3 weeks after tupping begins increases the number of lambs marked by 20 per cent. Rams, too, should be crutched and flushed for about 3 weeks before tupping. They should be dipped before this flushing period, as dipping too close to tupping appears to reduce ram fertility.

### COBALT DEFICIENCY

Bush sickness can be prevented by topdressing annually with cobaltised superphosphate, and in the North Island at least this is best applied in the annual autumn topdressing. Cobaltised superphosphate prepared in North Island works contains 3lb. of cobalt sulphate per ton. Two hundredweight of this fertiliser contains sufficient cobalt for 1 acre. In the South Island cobaltised superphosphate contains 6lb. of cobalt sulphate per ton, and 1cwt. of this contains sufficient cobalt for 1 acre. If greater quantities of fertiliser than these are used, the additional amount need not be cobaltised. For fuller details consult the Department's Bulletin No. 180.

### COPPER DEFICIENCY

Scouring in cattle and staggering in lambs grazing on peat and other copper-deficient land can be prevented by topdressing the pastures in autumn with 5lb. of bluestone per acre. Copperised superphosphate is now available, or the bluestone may be mixed with lime. For fuller particulars the Departments' Bulletin No. 238 should be consulted. Where topdressing is not practical, injections of copper cerate can be used.

### FACIAL ECZEMA

If warm rains fall in late summer or autumn, after a spell of hot weather, facial eczema is likely to occur in districts which are usually affected. Experience during recent years has conclusively shown that the disease can be prevented by shutting sheep up at a rate which leaves no pasture in the paddock after 24 hours. Sheep should be shut up as soon as rains fall and should be confined until the weather becomes either hot and dry or much cooler and the pasture visibly hardens. If the summer is hot, plans should be made for action as follows:—

Good hay at 2lb. per sheep per day will prevent loss of condition. Even if adequate hay is not available, ewes are not harmed by 1 or 2 weeks' starvation when ample water is provided. It is better to take precautions too often than to run the risk of a disastrous outbreak of facial eczema. If crops of rape, kale, turnips, or chou moellier are available, they can safely be grazed during the dangerous period. The grazing of such crops is the only satisfactory way of preventing the disease in lambs which react badly to restricted grazing. Lucerne has not proved safe, possibly because of ryegrass which is frequently present as a weed, but in east coast districts paddocks of pure white clover are safe and lambs do well on them. Bulletin No. 388, "Losses from Facial Eczema Can be Prevented", is available from all Departmental offices.

### PULLORUM DISEASE IN POULTRY

Preparations should now be made for the autumn hatch by blood-testing the flock for pullorum disease and by cleaning and fumigating the incubators. A vacuum cleaner is ideal for cleaning, and advice on fumigation may be obtained from the local Poultry Instructor.

### CARE OF CALVES

Autumn is a critical period for calves. Deaths during winter can be eliminated by rotating the calves through the paddocks ahead of the cows at intervals of 3 or 4 days. If this is not being done, it should be begun immediately. Calves so treated will be up to 100lb. heavier as yearlings than those kept confined in a calf paddock. If calves are unthrifty and scouring, it may be necessary to give two or three doses of phenothiazine at 3-weekly intervals, but this is seldom necessary with rotationally grazed calves.

### BOVINE INFERTILITY

Infertility may be due to several infectious diseases which are known to be present in New Zealand. Reliable tests for these are now available. If more than the usual number of cows are still empty, veterinary assistance should be sought promptly.

### SOWS AND WEANERS

Sows with litters should be fed each day 4 gallons of milk plus 2/3 gallon per pig suckled. Sows and litters should be allowed at least 2 hours' grazing per day.

It is an advantage to provide water sprays for both suckling and dry sows during summer, as pigs possess very few sweat glands and can be kept cool only by the evaporation of water from the skin. Litters over 3 weeks old must have milk and meal available at all times. Observations at Ruakura have shown that piglets suckle at intervals of 75 to 90 minutes throughout the 24 hours, and after the sixth week visit the creep after each suckling. Good creep management can add 6lb. to 10lb. per pig to the weaning weight.

Weaned sows must be well fed to ensure successful mating. A ration of 4 to 6 gallons of milk daily plus grass is essential. Weaned pigs should be fed 1½ to 2 gallons of milk daily. If the milk available is not sufficient to provide this, the feeding of meal to supplement the milk ration, 1lb. of meal replacing 1 gallon of milk, is highly profitable at the present prices of meal and meat.

### VITAMIN A FOR GROWING AND LAYING BIRDS

Vitamin A is essential to poultry for protection against various infections, particularly colds and contagious catarrh. Poor egg production is a common feature of an inadequate supply of vitamin A to laying birds.

Greenfeed is a useful source, but at certain periods of the year when this become scarce or poor in quality it may be of little value. Growing birds on open range may suffer from vitamin A deficiency during very prolonged spells of dry weather. Though there is apparently plenty of greenfeed available, it may be of very poor quality. The addition of one of the several vitamin A-rich products on the market such as synthetic vitamin concentrate powder, emulsion, or fish oil, when good-quality greenfeed is not available, is advisable for both growing and laying birds. The amounts used vary according to the product selected and the age of the birds to be fed. The quantity advised by the manufacturer of the product should always be followed when adding a vitamin supplement to the diet. Further advice on the use of vitamin A supplements may be obtained from the local Poultry Instructor of the Department of Agriculture, and a special leaflet on the subject is available.

# Provision of Grass and Cereal Winter Feed

## Seasonal Notes by the Extension Division

THE provision of winter feed is determined very largely by summer planning. These notes discuss the influence of fertilisers on winter grass, and the cereals and rapid-growing grasses which can be used for autumn-sown winter feed.

### NEW GRASS SOWINGS

TO produce the best quantity of winter feed autumn grass should be sown as early as possible from January onward. The best areas are those sown in January or February after a summer fallow. Areas sown in April are unlikely, under most South Island conditions, to produce feed until the following spring. Therefore it is advisable to sow new grass as early as possible, but it is no advantage to sow early if the ground is roughly prepared and not free of weeds.

In some of the more fertile districts both Italian and short-rotation ryegrass are commonly sown for winter feed. Italian and short-rotation ryegrass will produce abundantly in winter if they are sown early under conditions of good fertility on a well-prepared seed-bed. For town-milk supply there is no really satisfactory substitute for winter-growing grass to keep up winter milk production.

The production from new pastures under Canterbury conditions of low rainfall is double that of older pastures. In most low-rainfall South Island districts drilling of the seed is desirable, and it is better to use a 3½in. coulter to get quick cover rather than the standard 7in. coulter. Liberal use of lime and phosphatic fertiliser at sowing is generally necessary for best production.

### GREENFEED CEREALS

To obtain the quickest return from a crop put in at short notice to supplement winter grass growth reliance may still be placed on some variety of greenfeed cereal. The higher the fertility of the soil is the greater the volume of greenfeed that will be produced, so that these crops will do best after a fallow, and they will also produce good feed after peas, but generally they are sown after a cereal grain crop. They may be sown on run-out pasture land, as cultivation need not be extensive and the seed-bed is best left rubbly on top for the winter rains.

Where winter feed prospects do not look good at this stage of the year it is still possible to improve the prospects by sowing greenfeed cereals. Oats are the most common cereal used, with individual preferences for varieties such as Algerian, Dun, Abundance, Onward, or Russet. The barleys generally give more rapid growth, but do not recover from grazing as well. Cape and Black Skinless are commonly used. Wong seems to suit Marlborough conditions and recovers well after grazing.

For food value ryecorn is the best of the cereals. It is also the best for recovery from grazing, but usually it will not stand being left uneaten over the winter, as it is susceptible to rust. Ryecorn also seems to suit some localities only, mainly parts of Canterbury and the colder southern districts.

### AUTUMN WEED CONTROL

AT this time of the year it may be too late to deal with some weeds which have reached the seeding stage, but it is important at this stage to treat many weeds to prevent further spread. Scrub weeds, such as gorse, blackberry, and broom, are normall treated now. Thistles of various types may be sprayed now, though on hill country winged, variegated, and Scotch thistles should be sprayed from May onward. Grass weeds in lucerne also may be sprayed after the last cut. Seed production areas may be sprayed after harvest to clean them of some types of weeds for the following year. Californian thistle appearing after arable crops may be treated now if the ground is to be left for a period before working.

*—P. R. BARRER*

* * *

### AUTUMN TOPDRESSING

AUTUMN topdressing becomes particularly important when the stock-carrying capacity of grassland reaches a high level. Grass growth is at its lowest level in winter and any method of increasing it then is of very real benefit.

Of the three main points to consider in autumn topdressing, the most important is the selection of the correct fertiliser. The Extension Division has conducted field trials with various fertilisers on the major soil types of the Dominion over many years, and its instructors are thus able to give sound advice on fertiliser use. According to soil type one or more of phosphate, potash, lime, or trace elements such as molybdenum may be required.

The second essential in autumn topdressing is to topdress only those paddocks that have good drainage. Topdressing waterlogged pastures is of little value.

The third point is that the best paddocks to topdress are those that have a high proportion of ryegrasses, because these, particularly short-rotation ryegrass, have the highest potential for providing winter growth. Run-out pastures with a high proportion of browntop do not make efficient use of fertilisers.

The use of nitrogenous fertilisers as an autumn topdressing is advantageous on some dairy farms, more particularly town-milk supply farms, and here the first essential is to apply the nitrogen while the grass is making active growth; waiting until May when colder conditions limit grass growth does not always lead to optimum utilisation of applied nitrogen.

*—A. A. DUNCAN*

* * *

### DAIRY FARM RACE

ON the heavier soil types, a properly constructed dairy farm race not only facilitates the management of the property but is also essential to combat mud.

To be successful a race must be properly cambered, preferably with a road grader, and must be thoroughly consolidated before the metal is applied. Unless a high crown is formed, water will lie and bog holes will form in spite of metalling. Grading should be done early in summer so that there is plenty of time during the drier months for consolidation to take place. Metalling can be left to late summer or autumn. Soft rock, such as weathered greywacke or andesite, frequently referred to by farmers as rotten rock, should be used instead of hard, flinty material which does not pack down readily and usually leads to foot troubles.

The ideal width for a race is about 16ft. This is sufficient to enable tractors and implements to turn into gateways without difficulty and also provides enough room for maintenance work with the grader should this be necessary. On a farm with a very small herd the 4ft. race and narrow concrete strip give excellent results providing the concrete is adequately reinforced, but it lacks the convenience of the wider race, which also serves as a roadway for tractors and implements.

*—G. L. BANFIELD*

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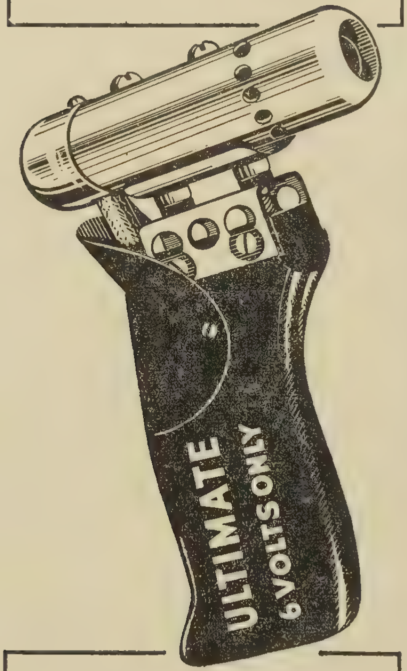

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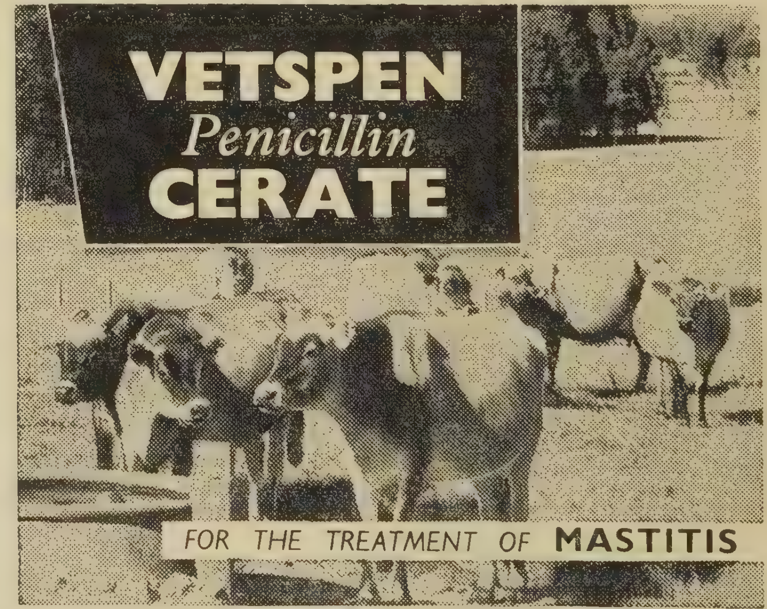

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# Precautions in Harvesting and Packing Honey

## Seasonal Notes for the Domestic Beekeeper

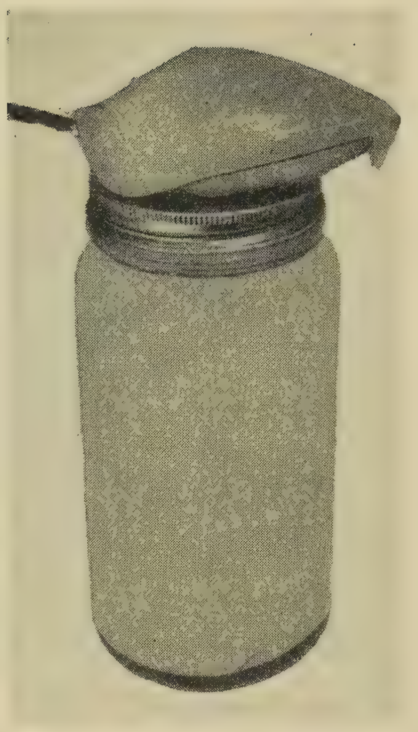
MANY domestic beekeepers aim to produce sufficient honey each season for their total family requirements, but do not take the necessary precautions to ensure that the honey is packed in good-keeping and fine-granulated condition suitable for table use until the next season's production. Each year many inquiries are received from domestic beekeepers because of the condition of their honey after several months' storage, particularly in regard to its keeping quality and the nature of granulation compared with that of local commercial retail packs. This article by the Horticulture Division of the Department of Agriculture explains precautions needed to ensure good quality.

THOUGH it would not pay a domestic beekeeper to install the expensive equipment used by many large-scale commercial beekeepers for harvesting and packing honey, he can pack his comparatively small crop in good-granulated and good-keeping condition if he follows certain principles at this time of year when harvesting and packing honey for home consumption.

A coarse-granulated honey loses much of its flavour, is unpalatable, and tends to sour more readily than liquid honey or honey with a smooth or fine grain. This condition can be avoided if certain facts about honey are understood and care is taken to follow certain rules.

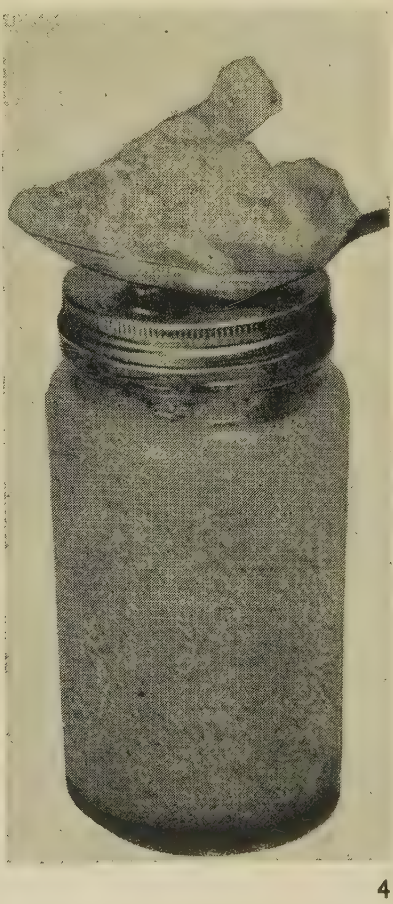
Few types of New Zealand honey will granulate readily in summer with a fine or smooth grain without the aid of a starter and cool temperatures.

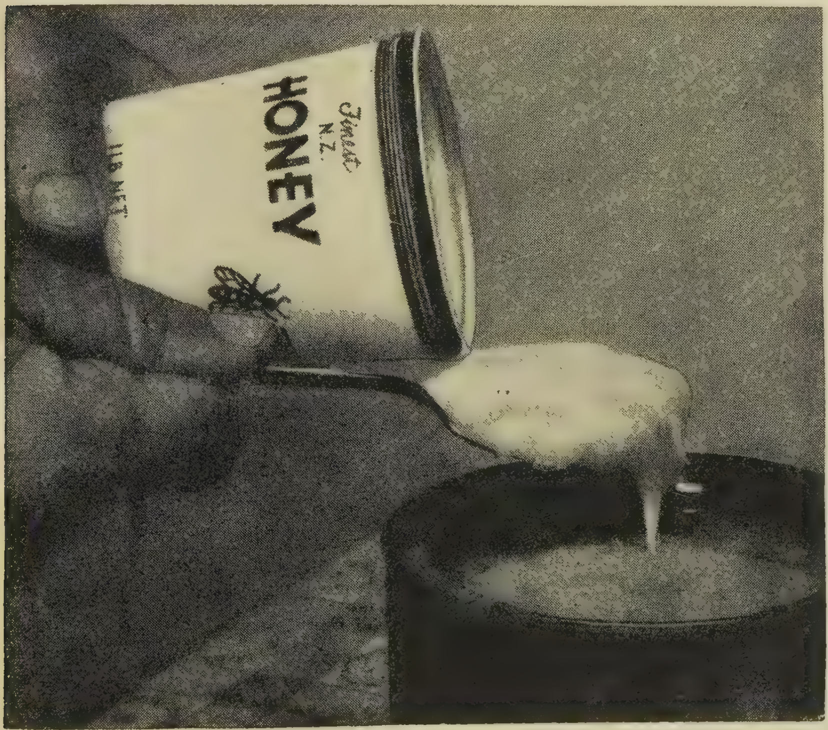
Honeys generally are of variable composition, depending on the flowers from which the chief supply of nectar in any locality is gathered. In addition to this the water content of any honey varies with the rapidity of the honey flow and atmospheric conditions during the period of collection and storage by the bees. The variation in sugars and water content largely accounts for the variation in granula-



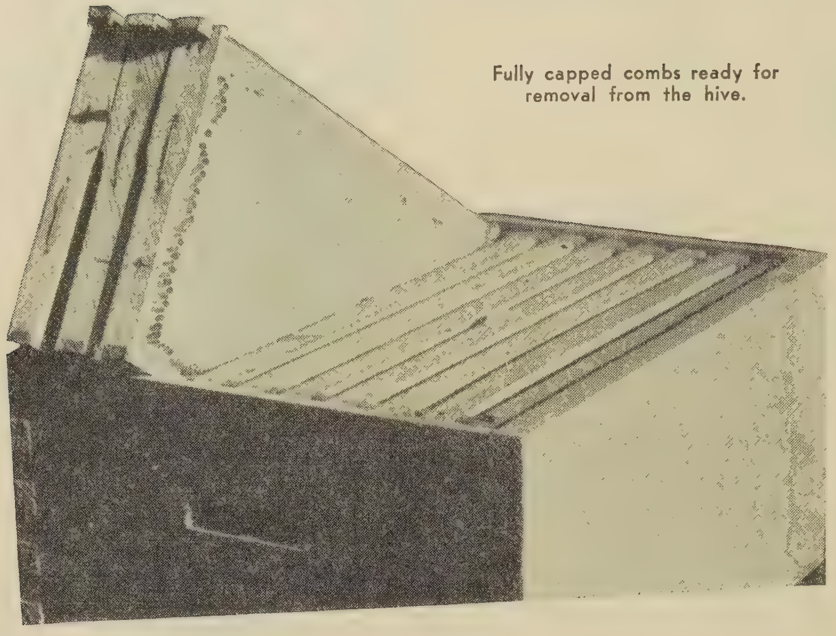
▲ Honey to which starter was added.

▼ Honey left to granulate without any starter.





Fine-grained honey being stirred into liquid honey. This seeds the liquid honey with fine crystals and ensures smooth granulation.



Fully capped combs ready for removal from the hive.

tion and keeping quality of honey generally.

## Assisting Granulation

In some southern districts and parts of the North Island a dry atmosphere during the honey-flow period coupled with cool nights as the season progresses provides ideal conditions for quick granulation. Under these circumstances it is not necessary for beekeepers to do more than clarify their honey, mix it well when it has cooled, and pack it immediately.

However, in most districts to assist granulation and to obtain a fine grain it is essential to add about 5 per cent. of smooth-grained starter honey and to mix the two portions thoroughly so that the fine crystals of the added starter become thoroughly distributed in all portions of the liquid honey. When this has been done and the honey allowed to settle for a few hours it may be stirred again and then run into the final containers and stored in a cool place. If a cool room is available, a temperature between 55 and 60 degrees F. is best for quick granulation, after which the honey may be kept in ordinary storage, though preferably in a cool place with a fairly even temperature.

When these precautions are not taken many types of New Zealand honey will be slow to granulate and eventually will do so with a coarse grain and probably go sour after a few months, particularly if kept in a warm atmosphere.

## Fermentation

Honey apparently in good condition at the time of extraction sometimes tends to sour and ferment after a few months' storage, particularly when it has been stored in a warm place. Far too much honey is lost in this way each year. Experience shows that such honey has been contaminated in some way during extracting and packing or has been handled and stored by the beekeepers under unfavourable conditions.

Yeast bodies which cause fermentation are present in a viable or living condition in unheated honey. Investigation has shown that these yeasts are unable to grow and multiply in well-ripened liquid honey because of the heavy concentration of sugars, which prevent their growth. However, when honey granulates there is a partial separation of the sugars and water, which gives a reduced sugar concentration in certain portions of the honey, in which the yeasts may grow.

## Precautions

Honey may be spoilt by added moisture absorbed while it is exposed to a damp atmosphere or accidentally introduced by the beekeeper during extracting.

No honey should be removed to the honey house at the height of the honey flow before it is all capped over by the bees and at other times unless it is at least 90 per cent. capped over, as otherwise there is a danger at this time of year of taking from the hives honey from which the normal amount of moisture has not been removed by the bees.

The storage of combs for any length of time during wet weather after removal from the hives and before honey is extracted should be avoided to prevent excessive absorption of moisture. For the same reason extracted honey should not be left uncovered and exposed to a damp atmosphere.

It is best for domestic beekeepers to pack their season's crop in comparatively small containers, 5lb. or 10lb. tins, so that the honey is consumed fairly quickly after being opened.

Where any doubt exists about the right time and methods for introducing a starter to freshly extracted honey or to heated liquid honey for reconditioning, information may be obtained from the local Apiary Instructor.

## Meteorological Records for November

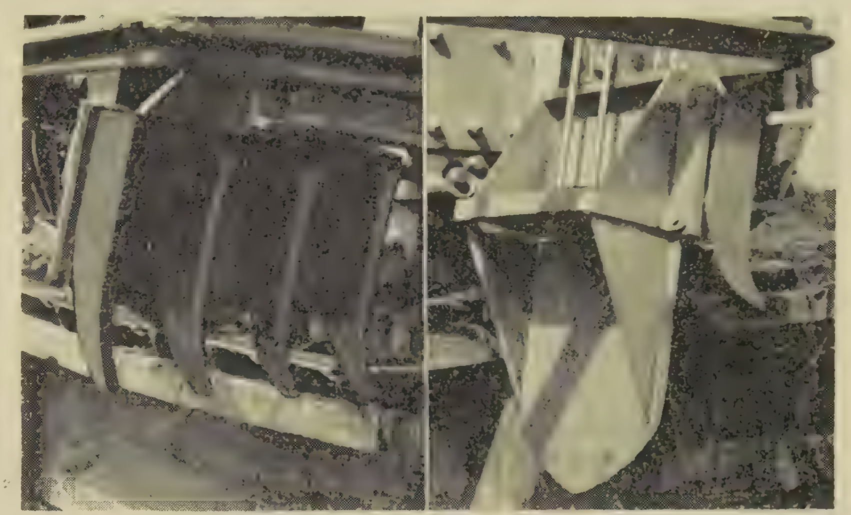
| Station | Height of station above M.S.L. (ft.) | Air temperatures in degrees (Fahrenheit) | | | | Rainfall in inches | | | | | Bright sunshine hours |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Approx. mean | Difference from normal | Absolute maximum and minimum | | Total fall | No. of days of rain | Difference from normal | Maximum fall | | |
| | | | | Maximum | Minimum | | | | Amount | Date | |
| Kerikeri .. .. | 201 | 61.0 | + 1.9 | 81.0 | 39.7 | 1.93 | 11 | — 1.91 | 0.80 | 9 | 241 |
| Auckland .. .. | 160 | 61.0 | + 0.6 | 76.5 | 47.8 | 2.75 | 13 | — 0.55 | 0.65 | 27 | 220 |
| Tauranga .. .. | 8 | 53.0 | + 1.1 | 74.6 | 30.8 | 6.30 | 15 | + 2.44 | 1.76 | 23 | |
| Ruakura .. .. | 131 | 57.5 | + 0.1 | 74.8 | 33.1 | 3.02 | 15 | — 0.66 | 0.99 | 27 | 217 |
| Whakarewarewa .. | 1006 | 57.0 | + 0.5 | 78.0 | 37.3 | 3.40 | 11 | — 0.75 | 1.17 | 27 | 203 |
| Gisborne .. .. | 14 | 60.1 | + 1.1 | 90.3 | 38.0 | 0.88 | 8 | — 1.71 | 0.23 | 2 | 233 |
| New Plymouth .. | 160 | 57.0 | + 0.2 | 68.2 | 42.2 | 8.16 | 23 | + 3.45 | 1.34 | 20 | 156 |
| Karioi .. .. | 2125 | 59.6 | + 0.8 | 76.1 | 40.5 | 1.83 | 12 | — 1.61 | 0.46 | 9 | 232 |
| Napier .. .. | 5 | 62.3 | + 2.7 | 86.6 | 39.9 | 0.80 | 7 | — 1.29 | 0.25 | 20 | 234 |
| Wanganui .. .. | 72 | 58.4 | + 0.2 | 77.8 | 40.9 | 4.20 | 14 | + 1.58 | 1.13 | 23 | 198 |
| Palmerston North .. | 110 | 58.0 | + 1.1 | 77.0 | 38.0 | 5.93 | 17 | + 3.07 | 1.45 | 27 | 144 |
| Waingawa .. .. | 340 | 57.1 | + 1.0 | 81.5 | 35.3 | 3.76 | 19 | + 1.06 | 0.56 | 26 | 196 |
| Wellington .. .. | 415 | 55.6 | — 0.2 | 69.8 | 42.1 | 7.76 | 18 | + 4.39 | 1.60 | 19 | 147 |
| Nelson airfield .. | 5 | 56.4 | + 0.9 | 69.9 | 38.0 | 4.16 | 18 | + 1.43 | 0.78 | 9 | 196 |
| Blenheim .. .. | 12 | 58.4 | + 1.5 | 80.1 | 34.0 | 2.77 | 13 | + 1.06 | 0.61 | 28 | 212 |
| Hokitika .. .. | 15 | 53.0 | — 0.8 | 66.6 | 37.1 | 12.75 | 23 | + 2.82 | 2.60 | 26 | 146 |
| Hanmer .. .. | 1270 | 54.2 | + 0.4 | 85.0 | 33.0 | 5.56 | 17 | + 2.08 | 1.50 | 26 | 163 |
| Christchurch .. | 22 | 56.9 | + 0.6 | 87.9 | 36.1 | 2.00 | 11 | + 0.18 | 1.00 | 26 | 160 |
| Ashburton .. .. | 323 | 56.0 | + 0.3 | 89.4 | 35.5 | 3.16 | 13 | + 0.71 | 0.73 | 26 | 153 |
| Timaru .. .. | 56 | 55.6 | + 0.1 | 79.7 | 36.3 | 2.57 | 16 | + 0.62 | 0.68 | 3 | 160 |
| Alexandra .. .. | 520 | 55.0 | — 1.4 | 79.4 | 34.9 | 3.23 | 15 | + 2.15 | 1.42 | 18 | 154 |
| Taieri .. .. | 80 | 52.8 | — 0.6 | 81.6 | 37.2 | 3.58 | 19 | + 1.30 | 1.02 | 27 | 122 |
| Invercargill airfield .. | 0 | 51.2 | — 0.6 | 75.9 | 35.4 | 7.30 | 21 | + 3.66 | 1.41 | 18 | 137 |
| Chatham Islands .. | 140 | 53.4 | + 1.4 | 63.3 | 39.0 | 2.44 | 16 | + 0.21 | 0.51 | 26 | |

# Mechanisation in *Phormium* Production

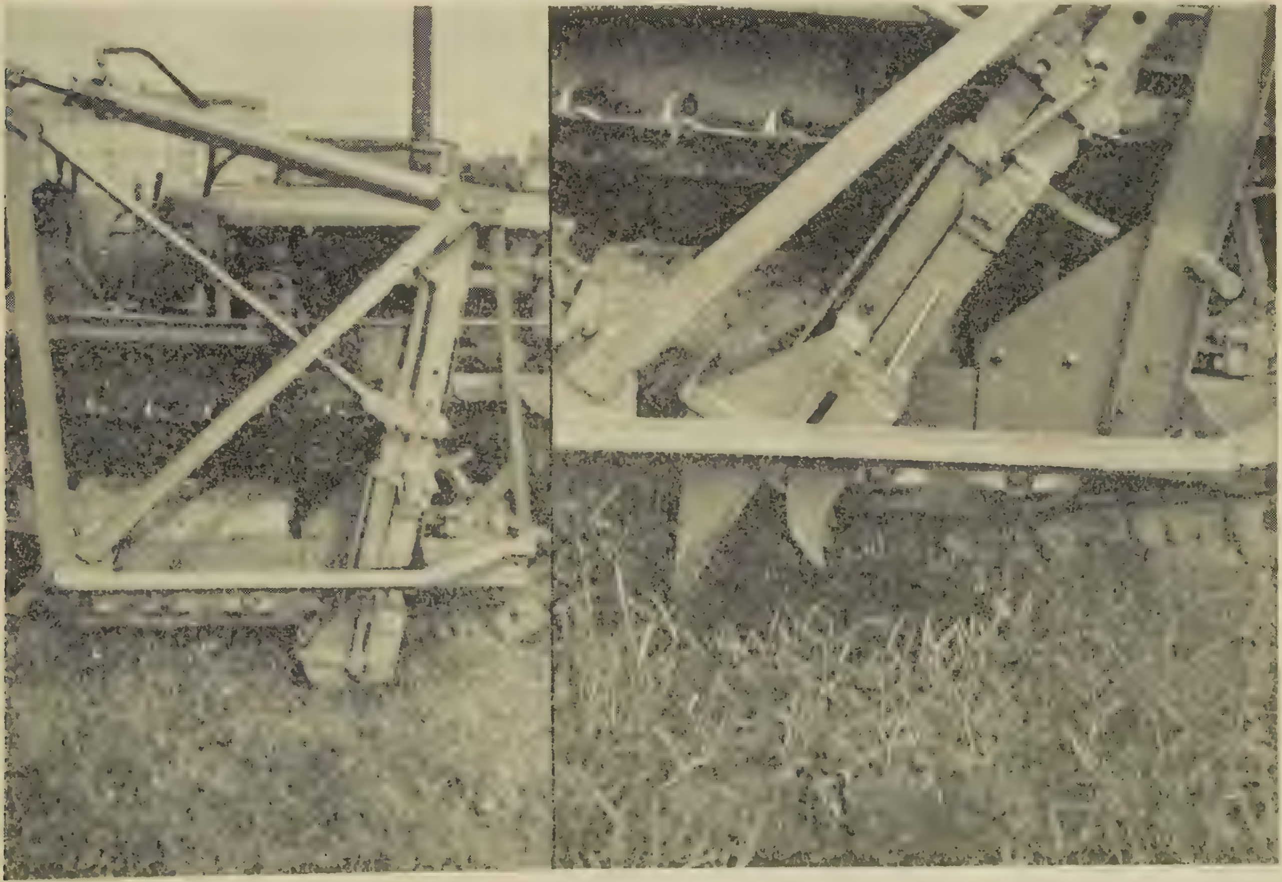
By H. W. T. EGGERS,
Engineer, Department of Agriculture,
Wellington

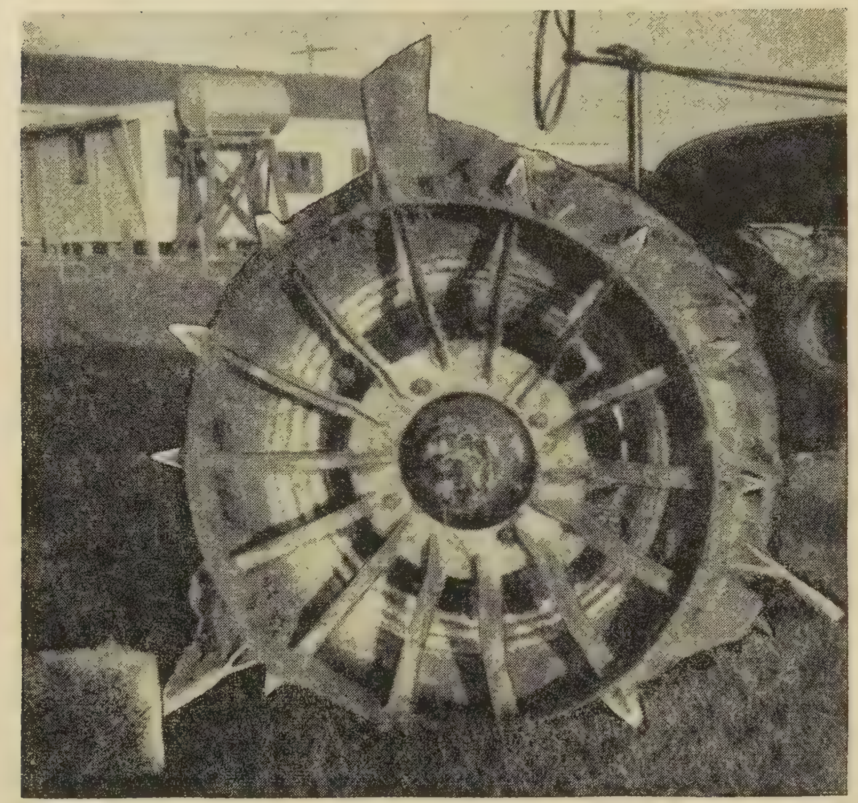
THE gradual cutting out of swamp *Phormium tenax* and its replacement by plantation *Phormium* has presented greater opportunity of reducing labour, and thereby costs, by the application of mechanical techniques such as those which have been actively followed on the Department of Agriculture's *Phormium* production area at Moutoa, near Shannon.

IN the growing of plantation *Phormium*, the ground is first prepared by clearing and deep ploughing and sowing to pasture. This pasture is grazed for two seasons and then planted with previously prepared fans of the type of *Phormium* required. Planting is arranged in rows 6ft. apart, plants being spaced 4ft. 6in. apart in the rows.



Equipment now used for fast replanting is mounted on a tractor and consists of a set of tines (above, left) to remove the growth and expose the soil surface. When the growth is removed a spade fitted with an ejector (above, right) is pushed into the soil (below, left) and on being withdrawn (below, right) lifts and deposits a turf, leaving a clean hole to receive the *Phormium* fan.





A tractor wheel fitted with spade lugs. As the tractor is driven along the lugs cut out the turf and deposit it ready for treading in with the *Phormium* fan.

This spacing calls for accurate positioning of holes, and with hand methods this was accomplished by aligning the rows with string, after which holes were dug at the required intervals and fans planted, the turf being replaced and trodden in.

## Planting

Planting was time consuming, so mechanical methods were devised to dig the holes. A conventional, tractor-mounted post-hole borer activated by the tractor's hydraulic equipment considerably speeded up the hole digging, but a much greater time-saver is the apparatus shown above. This consists of three spade lugs mounted round the rim of the tractor wheel equidistant from each other to give the spacing required for the holes. The row is sighted on pegs, and as the tractor is driven along, the lugs cut out the turf and deposit it ready for treading in with the *Phormium* fan. By this means holes are dug at the correct spacing as rapidly as the tractor moves, eliminating all time lost through stopping and starting as with the post-hole borer.

## Replanting

After the fans have been planted it is inevitable that some plants in the rows fail to strike. If the strike is generally good, these misses may not be of much consequence, but if the strike is only moderate, particularly over a large area, misses may represent a considerable loss in tonnage of leaf harvested.

With the rapid growth in moist, low-lying areas ground that was pasture at time of planting becomes a thick mat of swan grass and rushes during the year which must elapse before replanting can be attempted. By hand methods this growth is extremely difficult to penetrate to permit the removal of a turf suitable for replacement on replanting.

Hand replanting methods consist of passing along the rows of young plants and replacing all misses with fresh fans. The year's difference in growth between replantings and original stock is not of much consequence over the 12 to 14 years' life of the plants, which includes three cutting periods.

For mounting on a medium track-laying tractor hydraulically operated equipment has now been devised which does in seconds replanting work which previously took several minutes. This equipment (see illustration at upper left on page 43) consists of a set of tines to remove the growth and expose the soil surface. When the growth is removed a spade fitted with an ejector (see illustration at upper right on page 43) is pushed into the soil and on being withdrawn lifts and deposits a turf, leaving a clean hole in which to plant a fan and a compact turf for replacement and treading in. The lower illustrations on page 43 show the spade penetrating and retracted.

The forward stroke of the arm on which the tines and spade are mounted is the retracting stroke of the hydraulic ram. This clears the growth and at the end of its travel lowers the spade.

The backward stroke of the arm swings the spade clear of the soil, removing the turf, and at the end of its travel retracts the spade, which action ejects the turf, depositing it alongside the hole. With the retraction of the spade the equipment resets itself for a repetition of the cycle.

With this equipment one operator can drive the tractor down the lane between two rows of plants with the equipment overhanging one row. Ground clearance is sufficient to avoid damage to established plants, but if a miss is encountered the tractor is stopped, a hole dug for replanting, and the tractor moves on, the whole operation taking 8 seconds. A second team following up with fans on a trailer places one in the hole, and replaces and treads in the turf.

The design of this equipment uses the maximum thrust of the ram for doing the greatest work, that is, clearing the growth and forcing in the spade. The principle of triangle linkage converts the thrust from the horizontal to the vertical for this purpose.

◆

## Poultry Keepers' Course

A REFRESHER course for poultry keepers will be held at Massey Agricultural College on 11, 12, and 13 February.

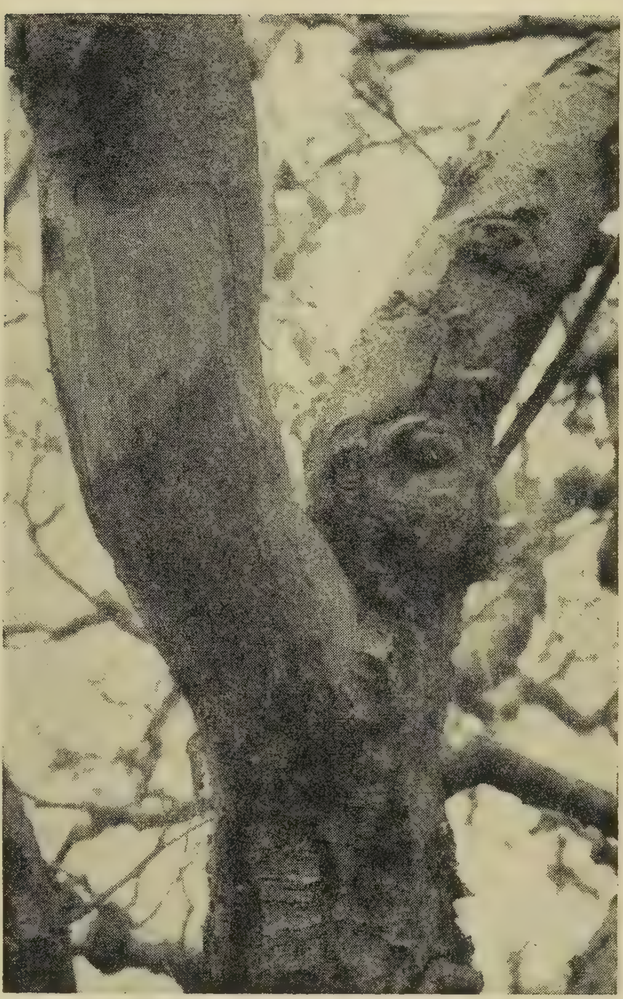
Copies of the programme of the course will be supplied on request by secretaries of poultry clubs, by the Registrar of Massey Agricultural College, Massey College Post Office, Palmerston North, or by the Secretary, New Zealand Poultry Board, P.O. Box 379, Wellington.

A similar course will be held at Canterbury Agricultural College in mid-May.

◆

# Collar Rot and Root Rot of Apples in Nelson and Marlborough

MANY Cox's Orange Pippin trees die each year in New Zealand apple orchards from collar rot, caused by the fungus *Phytophthora cactorum*, first identified in New Zealand in 1950 by Smith (1). Though diseased trees may be found in most if not all apple-growing districts, loss of trees is especially heavy in Nelson Province. These continuing heavy losses of Cox's Orange trees, coupled with the almost complete failure of remedial measures and the uncertainty of success when replanting in infected ground, are a serious threat to production of this important export variety. To secure a more accurate estimate of the extent of collar rot and to obtain information on predisposing factors and how the disease may be controlled or its incidence reduced, the survey described in this article was planned by the author and carried out by field officers of the Horticulture Division of the Department of Agriculture in Nelson and Marlborough during the spring and early summer of 1955-56.



A Cox's Orange branch infected with collar rot. Portion of the bark has been removed to show the canker.

AS the purpose of the article is to give the results of the survey, only brief reference will be made here to symptoms shown by infected trees. Attention is usually attracted to an infected tree first by failure of a portion of the tree to break into growth in spring. Alternatively, bud movement of one or more leaders may be late, subsequent growth is weak, and the foliage sparse and yellow (see illustration on page 47).

A superficial examination of the trunk may show nothing unusual, but removal of the outer layer of bark just above the bud union will reveal an underlying area of rotted, infected tissue, black or dark brown, merging into lighter brown toward the margin of the canker, where it joins healthy, white tissue. Illustrated at right is a typical canker, where infection has spread into the branches. As the disease progresses the trunk is completely girdled and death of the tree follows.

Though in Cox's Orange trees collar rot of the trunk **above** the bud union is the usual symptom of infection by *Phytophthora*, earlier observations on other varieties have indicated that this fungus attacks chiefly the roots and trunk below the bud union, that is, the portion of the tree provided by the rootstock.

By C. E. WOODHEAD,
Pip Fruit Specialist,
Department of Agriculture,
Palmerston North

## SCOPE OF SURVEY

As there was not time for a survey of all Cox's Orange orchards, a sample selection was made of orchards at Nelson, Mapua, and Motueka, and at Blenheim in Marlborough. This selection was designed to give adequate representation of orchards on alluvial soils and on the Mapua clay typical of the Moutere Hills, on which most of the orchards in the three Nelson districts have been planted. As the former are flat or slightly undulating and the latter gently to steeply rolling, this selection also provided for an estimate of the effect of ground slope on the incidence of collar rot.

Also included were a number of orchards in permanent grass, a recent development in orchard-soil management.

Identification of collar rot (infection above the bud union) in the orchard presented few difficulties. Time available did not allow examination of the roots of all trees showing symptoms of root rot (infection below the bud union). However, Plant Diseases Division of the Department of Scientific and Industrial Research made many positive identifications of *Phytophthora* in root specimens forwarded to it, indicating that this fungus was responsible for much of the root rot recorded.

Trees were grouped according to age and whether the variety was single-worked or topworked. The term "single-worked" is used in this article to denote trees in which the variety had been budded or grafted directly on to the rootstock, in contrast to topworked trees in which a previous variety had been reworked to the present variety. In the topworked tree the trunk and usually portions of the main arms of the former variety remain to form an intermediate stem between the rootstock and the top variety. As will be shown later, this intermediate stem proved to be an important factor in the incidence of collar rot.

## RESULTS OF SURVEY

### Collar Rot in Cox's Orange

The seriousness of collar rot in many orchards is shown by the fact that in 15 of the 69 orchards more than 15 per cent. of the trees were infected,

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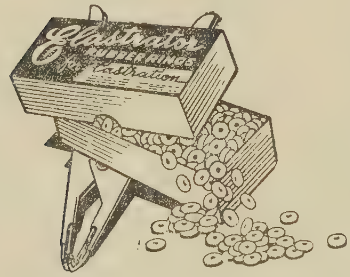
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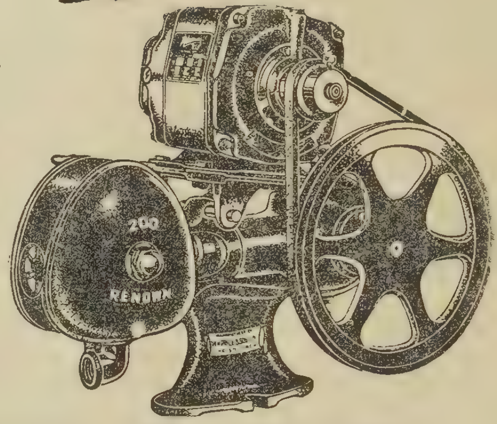

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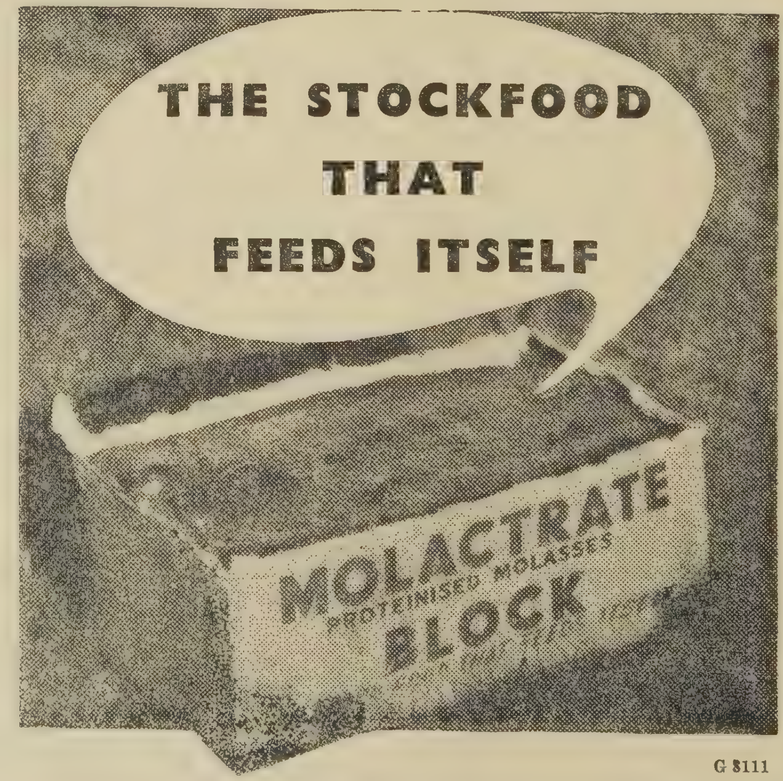
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A Cox's Orange tree which has been attacked by collar rot.

and some orchards had over 40 per cent. infection.

**Incidence in Relation to Age and Type of Tree**

**Single-worked trees:** Of a total of about 18,600 single-worked trees, 10.4 per cent. were infected with collar rot. A significant feature was the relation of tree age to incidence, as was shown by the progressive increase of incidence from 0.2 per cent. in trees up to 5 years of age to 17.7 per cent. in trees over 40 years. Mapua, with 22.6 per cent., had a much higher percentage of collar rot in single-worked trees than other districts, and more infection was recorded in Blenheim orchards than in Nelson and Motueka orchards.

**Topworked trees:** The low incidence of collar rot, 2.6 per cent., in the four districts' total of 6095 topworked trees was only a quarter of the infection recorded for single-worked trees and confirmed earlier reports of field officers that Cox's Orange topworked on other varieties was relatively free from collar rot. Results also indicate that, unlike single-worked trees, topworked trees up to 40 years of age have an insignificant incidence of collar rot.

Of 191 single-worked Cox's Orange trees on Northern Spy stock in this orchard, 75 have been replaced owing to collar rot. Only one tree has been lost of the 58 Cox's Orange topworked on Statesman. Both blocks of trees were planted in alluvial soil and are growing under similar conditions.

The incidence of root rot in single-worked Cox's Orange trees was very low compared with that of collar rot. In this connection it was noteworthy that in Cox's Orange trunks spread of *Phytophthora* infection downward past the bud union, that is, into the rootstock, was rarely observed.

## Collar Rot in Other Varieties

It is clear from this survey that topworking Cox's Orange on other varieties gives a very large measure of protection against collar rot. However, if full advantage is to be taken of this knowledge in future planting it is also necessary to know what varieties are likely to be satisfactory intermediates for both resistance to collar rot and compatibility with Cox's Orange.

The survey showed that collar rot was insignificant in single-worked trees of all other varieties with the exception of Gravenstein, which had 2 per cent. of trees infected.

In topworked Cox's Orange trees Ribston Pippin as the intermediate variety was more severely affected by collar rot than was the single-worked Cox's Orange. As the Cox's Orange was raised from a seed of Ribston Pippin, its susceptibility to collar rot would appear to have been inherited from the Ribston parent.

There was a fairly high incidence, 5.1 per cent., in trees on Sturmer intermediate, confirming the results obtained by Smith (2) in inoculation tests on this variety. Nevertheless, the fact that Sturmer is much more resistant than Cox's Orange to collar rot is well shown in the illustration on page 49. Here healthy Golden Delicious topworked on Sturmer are seen in a Blenheim orchard growing close to a dying Golden Delicious tree topworked on Cox's Orange. The illustration on page 51 is a near view of the latter tree, showing infection of the Cox's Orange intermediate by collar rot.

Of the 66 Golden Delicious trees topworked on Cox's Orange in this orchard, 35 were infected with collar rot, in marked contrast to the 70 trees of the same variety topworked on Sturmer, all of which were healthy. This example clearly illustrates the risk of reworking Cox's Orange trees to another variety where collar rot is prevalent.

Though no infection was found in trees topworked on six of the intermediate varieties observed, in each case only one block was available for observation. Consequently, less reliance can be placed on the data recorded for these varieties than for varieties where observations were

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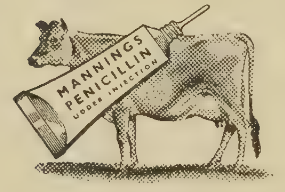

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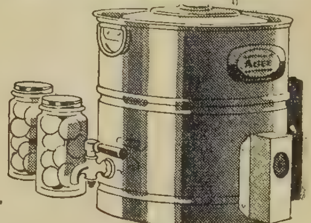

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made on several blocks and a larger number of trees.

In the latter category, trees on Dunn's Favourite intermediate (11 blocks), and Statesman intermediate (4 blocks), with respectively 2.3 and 1.7 per cent. infection, were highly resistant when compared with single-worked Cox's Orange trees of the same age group with 12.1 per cent. infection. It appears that either of these two varieties would provide a resistant intermediate for future propagation of Cox's Orange trees. Observation of the growth of Cox's Orange topworked on the two varieties indicated that they are also highly compatible.

## Collar Rot and Soil Type

Records were made of collar rot in Cox's Orange single-worked trees on alluvial and clay soils. The alluvial soils included several types from different parent material; the clay soils, on the other hand, were of one type only—the Mapua clay typical of the Moutere Hills.

Results showed that in the Nelson and Motueka districts collar rot was more prevalent on clay soils, but that there was more collar rot on the alluvial soils of Blenheim than in Nelson and Motueka orchards on clay. The highest incidence of collar rot, 25.9 per cent., was recorded in orchards on clay soils at Mapua. When compared with 5.2 and 6.9 per cent. respectively on the same soil at Nelson and Motueka this is difficult to explain, but the fact that the majority of trees at Mapua are more than 40 years of age may be partly responsible.

## Collar Rot in Grassed Orchards

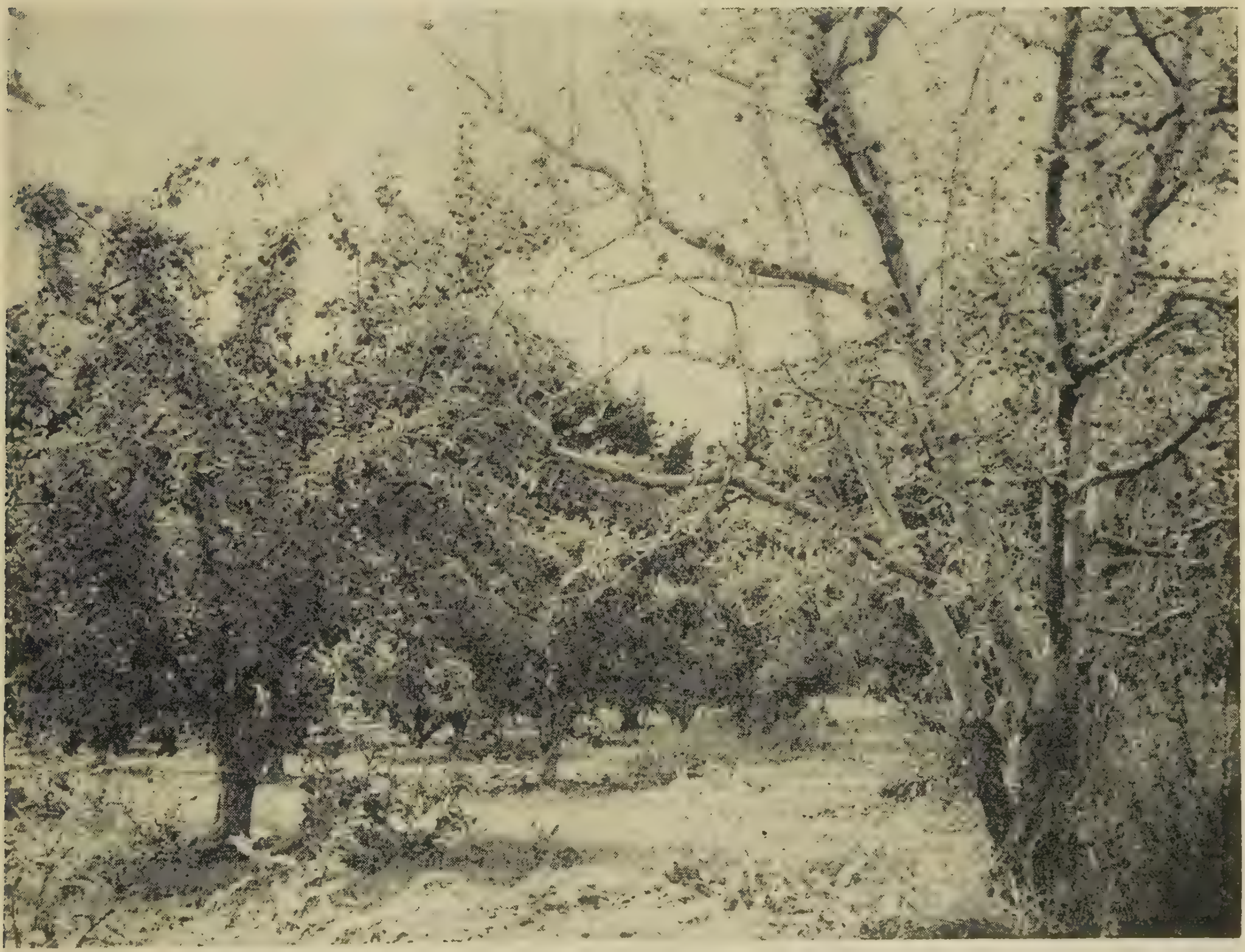
Incidence of collar rot in Cox's Orange was observed in seven grassed orchards. As only one of these orchards had been grassed as long as 3 years and three were grassed in the year preceding the survey, no final conclusions could be drawn, but the evidence appeared to be against any effect of grassing.

## Other Factors

A survey of other environment and management factors showed clearly that poor drainage is the dominant factor in the incidence of collar rot in single-worked Cox's Orange trees, and this conclusion is supported by the fact that of four single-worked Cox's Orange orchards with a history of **no** collar rot infection two were planted on a well-drained sandy loam and a third on dry, stony soil.

Degree of ground slope also appears to be related to incidence of collar rot, as orchards on gently sloping ground had higher infection than those on steep slopes.

**As slope and its effect on drainage are significant factors in reducing incidence, one would expect to find a high proportion of the severely infected orchards on flat land. The survey did not show this. On the contrary, field officers when noting special features asso-**



At left is a healthy Golden Delicious topworked on Sturmer and at right is a Golden Delicious topworked on Cox's Orange and dying from collar rot.

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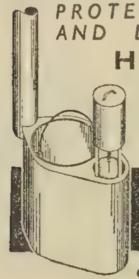

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**A producer to producer link across the world**

TWO New Zealand farmers' co-operatives have shown that it is better to work *with* farmers overseas than against them. They were the first to put into practice the principle of "producer-to-producer" marketing of agricultural produce, by selling meat in the U.K. through the Fatstock Marketing Corporation – a British producers' marketing organisation.

For over two years now the New Zealand meat shipped to Britain by Producers' Meats Ltd. of Auckland and the Primary Producers' Co-operative Society (Otago) Ltd. has been marketed by FMC. This represents, not competition between farmers in the two countries, but co-ordination and co-operation for their mutual benefit.

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**ciated with the particular location of trees infected with collar rot frequently recorded pockets of infected trees in wet areas at the foot of slopes, in hollows on slopes, and in gullies between slopes. Therefore, wet trouble spots may occur with greater frequency in rolling country than on flat land.**

As previously noted, soil type appears to be linked with collar rot incidence, infection of orchards on clay soil being in general, more severe. As with slope of ground, however, the connection between soil type and drainage cannot be disregarded. Other factors appear to be of little or no significance.

Under conditions of defective drainage risk of infection must obviously be increased where the union of rootstock and Cox's Orange scion is at ground level or buried in the soil. This is clear from a comparison of collar rot infection in single-worked and topworked trees. During the survey it was observed that, with a few exceptions, the initial infection by *Phytophthora* had occurred in the Cox's Orange wood at the bud union, which was in most instances at ground level or underground. In only a comparatively few trees was infection noted which had started at a point high up on the trunk or crotch, the maximum height recorded being 30in.

## Root Rot in Other Varieties

The survey showed that in trees of the other main varieties susceptibility to root rot increases with age, little or no infection occurring in trees up to 10 years, but infection increasing thereafter in a more or less regular pattern to the maximum recorded in trees more than 40 years of age. Delicious (see illustration on page 52), with 7.9 per cent. infected trees in this age group, was the most susceptible variety, closely followed by Gravenstein and Jonathan.

Root rot recorded for the four districts in older trees of the important varieties Delicious, Jonathan, and Sturmer showed a high incidence in all three varieties at Mapua. Infection was also severe in Nelson orchards. At Blenheim a high incidence was recorded in the variety Delicious, indicating that root rot is also serious in orchards on well-drained sandy loams. Infection was relatively slight in the Motueka district.

Root rot occurred in Delicious trees to a similar extent on both soil types, but was more prevalent in Jonathan and Sturmer on clay soil.

The survey yielded little information on susceptibility to infection of different rootstocks, including East Malling types, though root rot was recorded separately for trees on different stocks. Trees more than 10 years of age were almost invariably on Northern Spy stock and, as already indicated, root rot in trees under this age was too insignificant for a correlation with rootstock type to be attempted.

A near view of a Golden Delicious on Cox's Orange dying from collar rot. This is the same tree as is shown at right in the illustration on page 49.

## CONCLUSIONS FROM SURVEY

### Collar Rot

The survey has shown that collar rot is a serious disease of single-worked Cox's Orange Pippin trees in Nelson and Marlborough orchards, incidence being especially high in the Mapua district. The disease is of little significance in other varieties with the exception of Gravenstein.

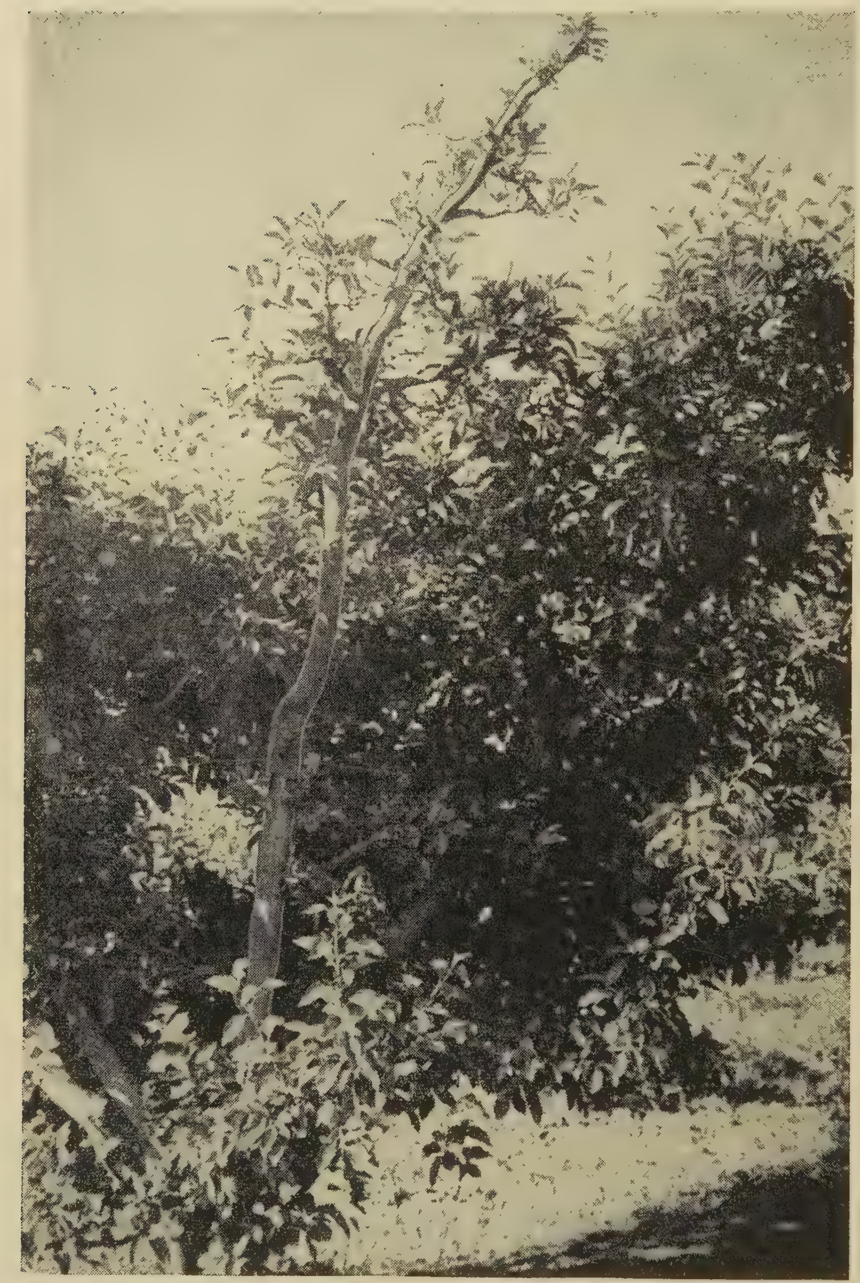
Though young trees are not immune, incidence of the disease in trees up to 20 years of age is low, but under conditions favourable to collar rot the disease may become serious at any time after this age.

It has been shown conclusively that topworking Cox's Orange on other varieties reduces the risk of infection by at least 75 per cent. and that collar rot is insignificant in topworked trees up to 40 years of age.

Defective drainage appears to be the dominant factor in increasing the disease. Though orchards showing high infection were most frequently located on clay soil and on gentle rather than steep slopes, probably these factors are important only to the extent that drainage is detrimentally affected.

The evidence from grassed orchards, though inconclusive, does not suggest that grassing is an effective remedy.

There is also no clear indication that collar rot is increased where pre-



A Delicious tree infected with *Phytophthora* root rot, showing the lack of growth on one leader.

blossom copper sprays (bordeaux mixture) are not included in the spray programme.

## Root Rot

The survey has also revealed a high incidence of root rot in trees more than 40 years old of the varieties Delicious, Jonathan, and Sturmer, other varieties being affected in varying degree. It is also clear that the disease is prevalent in orchards on both light and heavy soils and must obviously play an important part in limiting the life of apple trees in commercial orchards.

## RECOMMENDATIONS

Until fully effective control of these diseases is possible, whether by chemical treatment of the soil or by use of *Phytophthora*-immune rootstocks, the following recommendations should assist in reducing infection.

### Treatment of Existing Orchards

To reduce the incidence of collar rot in Cox's Orange trees, attention should be given to the following:—

Drainage, especially of clay land at the bottom of slopes and in gullies.

Promotion of drier conditions around trees by removal of grass and weeds in autumn, thus exposing the tree trunks to sun and air during winter and spring.

Preventing contact of the Cox's Orange wood with the soil by ensuring that the bud unions of trees do not become buried. **When clearing bud unions on shallow clay soil saucer-like depressions around the tree trunks, in which rain-water will accumulate, should be avoided.**

Drainage is also important in the prevention of root rot and is at present the only treatment that can be suggested.

### Future Orchards

**To give protection against collar rot future orchards of Cox's Orange should be planted with trees of a type that will ensure that no Cox's Orange wood is closer to the ground than about 36in.**

The raising of such trees in commercial nurseries would be difficult and costly. However, fruit growers have two alternatives. The first is to plant trees of a comparatively resistant variety—Dunn's Favourite or Statesman is especially recommended—and a year or two later rework the branched trees to Cox's Orange at the height recommended.

The second alternative is to plant unworked rootstocks and when they are suitably branched graft them with Cox's Orange. This method should obviously be used if stocks immune to *Phytophthora* infection become available.

Under present conditions, however, the first alternative is likely to save time, as rootstocks just off the stool are usually too sparsely rooted and slender to be headed back for branching until a year after planting.

On clay land the steeper slopes should be selected for the planting of Cox's Orange, as they are likely to have better natural drainage. As a precaution against root rot the drainage of planting sites for other apple varieties should also receive attention.

#### Acknowledgments

Acknowledgment is made to Dr. F. J. Newhook, Plant Diseases Division, Department of Scientific and Industrial Research, for identification of numerous disease specimens.

#### References

(1) Smith, H. C., 1950: Collar-rot of Apples and Gooseberries. "The Orchardist of New Zealand", vol. 23, No. 11, 1950-51.

(2) Smith, H. C., "Collar-rot and Crown-rot of Apple Trees", "The Orchardist of New Zealand", vol. 28, No. 10, 1955.

# Side-mounted Drain Cleaner

By C. M. B. OLIVECRONA,
Machinery Instructor, Department of Agriculture,
Wellington

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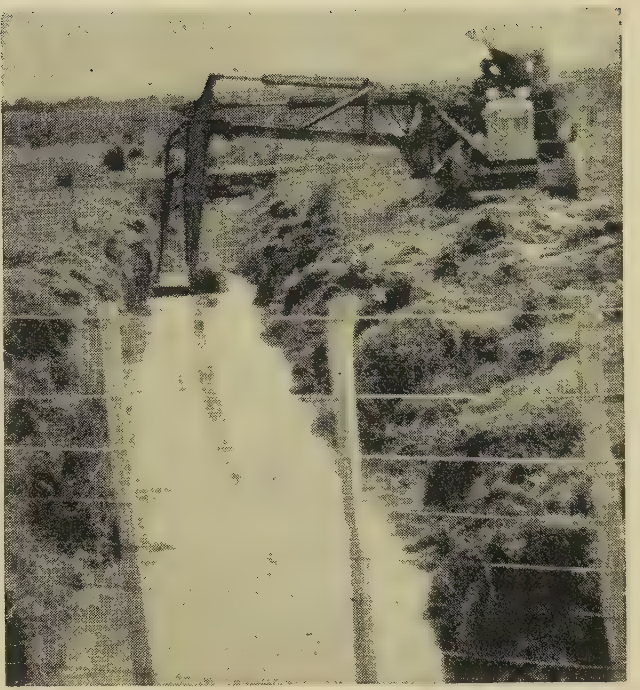
A SIDE-MOUNTED, hydraulically controlled drain cleaner for wheel tractors as shown at right is a further improvement to the many mechanical aids to drain cleaning that are already available in New Zealand. This type of mounting has eliminated the tedious manoeuvring to discharge the filled buckets that is necessary with front- or rear-mounted cleaners.

A machine with this mounting can be driven parallel to the drains, depositing the sludge behind it. This enables quicker clearance with minimum disturbance of drain edges (see illustration at right).

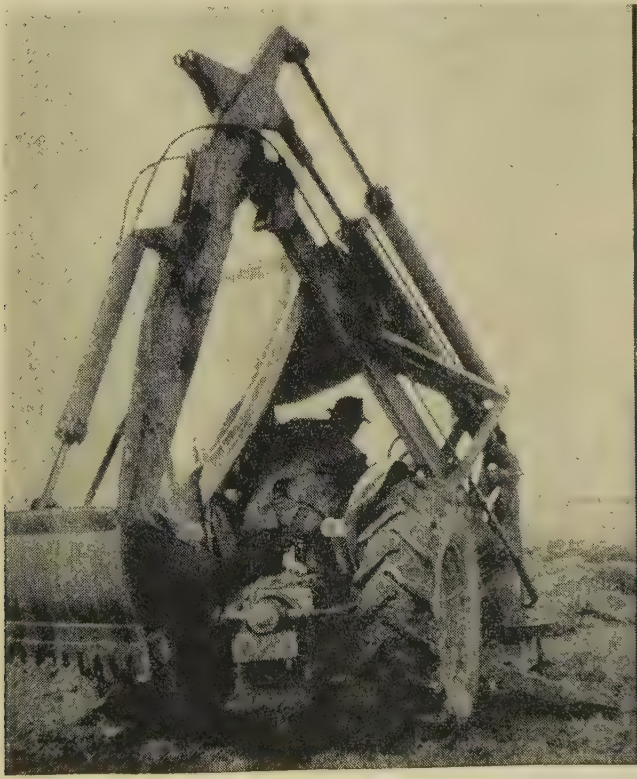
The implement illustrated can deposit cleanings in front, behind, or at the side, as it has an arc of travel of about 270 degrees. (See illustration left below.)

A hydraulically controlled foot with the counterbalancing device used when the implement is working on drain edges is shown in the illustration at right below.

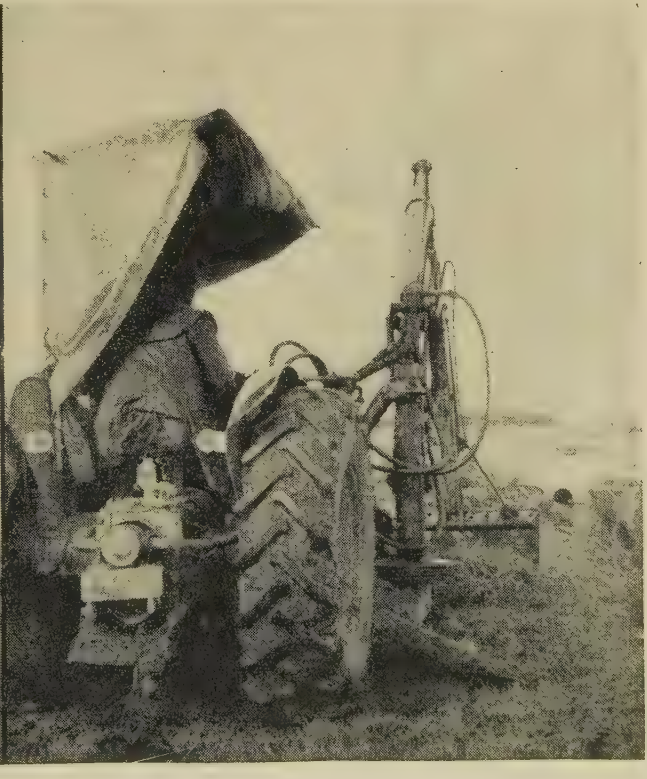


The machine can drive parallel to the drain and deposit the sludge behind it. This enables quicker clearance with minimum disturbance of drain edges.

▼ The implement can deposit cleanings in front, behind, or at the side, the shovel having an arc of travel of about 270 degrees.



▼ The foot shown at the right of the machine is hydraulically controlled and is used as a counterbalance when the machine is working drain edges.



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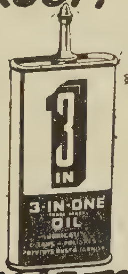

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# NEW OPPORTUNITIES IN AGRICULTURAL SCIENCE FOR HOLDERS OF UNIVERSITY ENTRANCE

Boys interested in a rewarding career in agricultural science are invited to inquire before March 1, 1958, for details of the new Rural Field Cadet awards which enable study at either Massey College or Lincoln College for the degrees of Bachelor of Agriculture or Bachelor of Agricultural Science.

Selections for the 1959 University year will be made in July, 1958. Those intending to apply must be prepared to spend a second year in the Sixth Form next year. Qualifications desired are a good scholastic record—preferably in chemistry, physics, biology and/or mathematics — and some farming experience. A good standard of physique, appearance and personality is sought, and notice will be taken of any success achieved in school and outside activities.

The new study award scheme is designed to combine academic study at Agricultural Colleges with practical training on selected farms. All costs will be met, including University fees, board, lodging and out-of-pocket expenses. During the working period, award wages will be paid by farmer employers.

This entirely new scheme aims at producing more agricultural scientists, research workers and extension officers, and will be of the utmost importance to the future of New Zealand's farming industry.

If you are likely to be interested, write to The Supervisor, Rural Field Cadet Scheme, State Advances Corporation, Wellington; or, The Secretary, Public Service Commission, Bowen Street, Wellington.

# "Forced Moulting" to Increase Autumn and Winter Egg Laying

THE part played by "forced moulting" as a means of ensuring a steady supply of eggs during the period of high egg prices in autumn and winter, when it is important that the poultry farmer keep production up, is discussed in this article by J. Edmondson, Poultry Experimentalist, Department of Agriculture, Upper Hutt. Reference is made to the use of "Entramin" for forcing the moult.

IT is natural for a hen to moult each year, but the time of moult and the nature and length of the moult can be influenced to a great extent by management and feeding. Birds normally begin to moult in February and March and remain out of production for 8 to 10 weeks at a time of the year when egg prices are at their highest. Many of the new season's pullets are still producing small eggs and consequently poultry farmers may expect a favourable price for hen eggs.

One of the most obvious methods of influencing the pattern of egg production to coincide with the seasonal price increase for eggs during autumn and winter is to induce yearling hens to moult earlier than they would normally do. They would then resume laying and be in full production when egg prices start to rise in autumn.

If birds can be induced to moult in January or early February and can be brought back into full lay in April, they will be more profitable. Hence the practice known as "forced moulting".

In theory this is a splendid plan. In practice there are attendant difficulties. Care and attention to detail are necessary if the birds are to be successfully moulted through and brought quickly back to full production. Those who create the impression that the process is simple are probably not speaking from experience.

It is comparatively easy to cause the majority of the flock to start moulting in January or early February, but even at this time the best layers tend to moult long after others are dropping feathers freely. The earlier in the season the process of forced moulting is put into operation the more difficult it will be. As the birds approach closer to their natural moulting time the easier the task becomes.

A flock must be culled well before forced moulting. Birds which would not normally be kept for another laying season can be removed, placed in a separate house, and encouraged to lay at a high rate until they are disposed of.

## Inducing Moulting

Moulting is induced by a severe reduction in the ration. Treatment must be drastic to achieve the required results. If the birds can be moved to a strange house and confined to it, this will help.

A procedure which has been used with a good measure of success consists of removing the drinking water for 24 hours and removing all food for 48 hours. After this preliminary "shock treatment" a small amount of grain is fed twice a day at ½oz. per bird at each feed. No mash is fed. This treatment will check egg production within a few days and feathers will start to drop freely. The birds must be well in the moult before more liberal rations are fed.

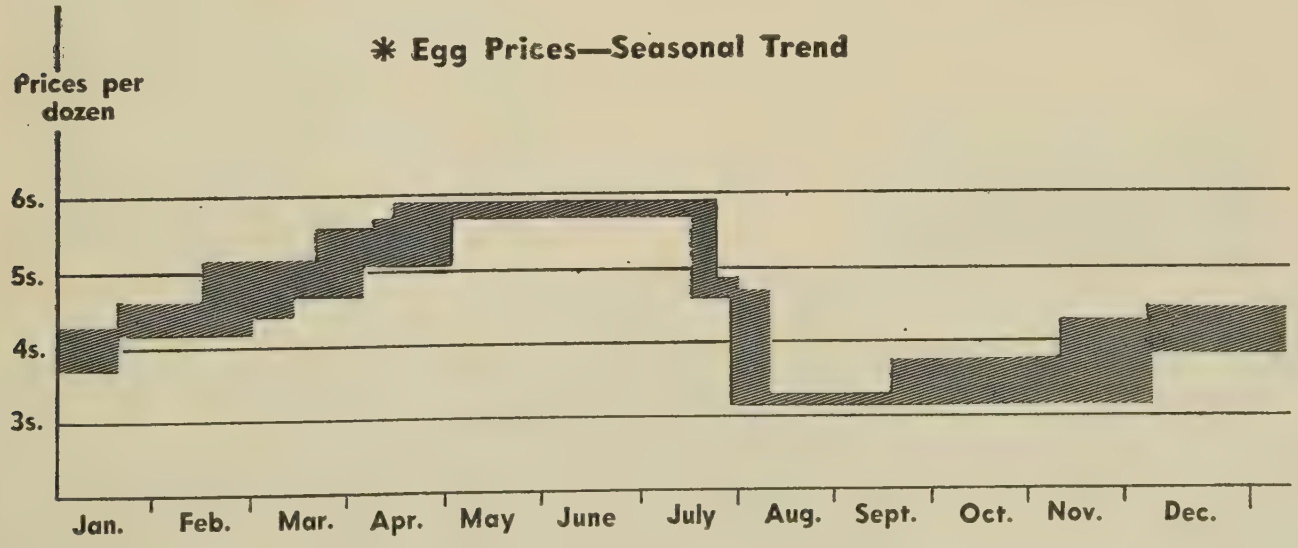
The length of time before the birds are moulting properly will depend on how early in the season the procedure is adopted, the condition of the birds, and their excellence as layers. A week to 12 days will probably be sufficient, but wing feathers should be dropping freely before a more liberal ration of grain is fed, followed by gradually increasing amounts of mash. Four to 5 weeks from the start of treatment the birds should be back to a normal laying ration.

The use of artificial lighting is of considerable value in bringing birds back into production after the moult and in ensuring a satisfactory level of production in winter.

## Use of "Entramin" for Forced Moulting

Research workers overseas report satisfactory results using the drug 2-amino-5-nitrothiazole as a means of force moulting yearling hens as an alternative to the method of reducing food and water intake. This drug is more commonly known in this country under the proprietary name of "Entramin" and has been widely used for the prevention and treatment of blackhead in turkeys and chickens.

Results obtained show that the use of 2-amino-5-nitrothiazole was a more satisfactory method of inducing a moult in yearling hens than reducing food consumption. Mortality and body-


**✱ Egg Prices—Seasonal Trend**

✱ Based on wholesale prices in the North Island for the last 3 years.

## FORCED MOULTING OF LAYERS . . .

weight losses were reduced and subsequent egg production, fertility, and hatchability were favoured.

A test comparing the two methods referred to has been conducted at the Department of Agriculture's Poultry Demonstration Plant, Upper Hutt. "Entramin" pre-mix was fed in the mash to 50 yearling White Leghorn hens. A similar number of birds were force moulted by restriction of food and water. Treatment began at the end of January and both groups were in 50 per cent. production by the first week in April.

Variation between the two groups has been of no apparent practical significance apart from a greater bodyweight loss in the restricted food group. In both groups egg production ceased in just less than 2 weeks after treatment started and remained at zero for a month. Three weeks later both groups were laying at the rate of 50 per cent. production and continued to lay well through winter and up to November.

A number of poultry farmers in New Zealand have tried "Entramin" as a means of forcing the moult with varying success. The main difficulty does not appear to be its efficiency in inducing the moult or in the subsequent rate of lay, but in the method of administration.

### Administering the Drug

The drug may be administered in two ways: In the mash, as in the test referred to above, or in the water. Where treatment is given in the water there appears to be a distinct danger of causing nausea and deaths during the treatment period, particularly in hot weather. There is a possibility that treated water is unpalatable and that consequently birds will not drink sufficient water to meet requirements on a hot day, or conversely that increased water consumption results in an overdose of "Entramin".

**In the light of such experience it is suggested that "Entramin" pre-mix be used in the mash and not in the water, thereby ensuring a controlled intake.**

Breeders using "Entramin" to force the moult in yearling hens intended for breeding have been satisfied with subsequent fertility and hatchability results. Research workers overseas support this finding. The future programme of work at the Poultry Demonstration Plant is expected to include a check test for fertility and hatchability of eggs from birds force moulted with "Entramin" and also, if possible, a check on the subsequent chicks.

It should be clearly understood that forcing the moult is not a method of making profitable layers out of inherently poor birds. To attempt such a programme with flocks which are not the result of reasonably good breeding is a waste of time and money.

Forced moulting with breeding stock is widely recognised as being necessary to bring birds back into production in time for the breeding season. A breeder would probably put his breeding stock into a moult at the end of February. Whereas with a commercial laying flock the aim is to reduce the time of moult to a minimum, breeding stock should not be hurried through the moult, but given time to rest and recuperate.

☆

# Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of April:—

### NORTH ISLAND

**February**

1 February—Otorohanga A. and P. at Otorohanga.

1 February—Rangitikei A. and P. at Taihape.

6 February—Matamata A. and P. at Matamata.

7 and 8 February—Taranaki A. and P. at New Plymouth.

*7 and 8 February—Taumarunui and District A. and P. at Taumarunui.

8 February—Hukerenui A. and P. at Hukerenui.

8 February—Woodville A. and P. at Woodville.

11 and 12 February—Dannevirke District A. and P. at Dannevirke.

12 February—Te Awamutu A. and P. at Te Awamutu.

14 and 15 February—Franklin A. and P. at Pukekohe.

*14 and 15 February—Ohura A., P., H., and I. at Niho Niho.

15 February—Waiapu P. and I. at Ruatoria.

15 February—Pahiatua A. and P. at Pahiatua.

15 February—Northern Wairoa A. and P. at Mititai.

15 February—Opotiki A. and P. at Opotiki.

21 and 22 February—Masterton A. and P. at Masterton.

*21 and 22 February—Te Kuiti and District A. and P. at Te Kuiti.

22 February—Putaruru A. and P. at Putaruru.

22 February—Whakatane A. and P. at Whakatane.

26 February—Morrinsville A. and P. at Morrinsville.

*28 February and 1 March—Wellington and Hutt Valley A. and P. at Trentham.

**March**

1 March—Waiotira Junction A. and P. at Waiotira.

1 March—Mangonui County A. and P. at Kaitaia.

1 March—Albany A. and P. at Albany.

1 March—Te Puke A. and P. at Te Puke.

8 March—Kumeu A. and P. at Kumeu.

8 March—Tauranga A. and P. at Tauranga.

*15 March—Wellsford A. and P. at Wellsford.

15 March—Hawke's Bay A. and P. at Hastings.

22 March—Poverty Bay Autumn Carnival at Gisborne.

### SOUTH ISLAND

**February**

1 February—Banks Peninsula A. and P. at Little River.

8 February—Palmerston and Waihemo A. and P. at Palmerston.

15 February—Murchison A. and P. at Murchison.

15 February—Inangahua A. and P. and Sports at Reefton.

22 February—Maniototo A. and P. at Ranfurly.

*22 February—Kaikoura A. and P. at Kaikoura.

**March**

*1 March—Temuka and Geraldine A. and P. at Winchester.

8 March—Cheviot A. and P. at Cheviot.

*8 March—Mount Benger A. and P. at Roxburgh.

15 March—Hawarden A. and P. at Hawarden.

*15 March—Upper Clutha A. and P. at Wanaka.

22 March—Mayfield A. and P. at Mayfield.

*29 March—Methven A. and P. at Methven.

**April**

7 April—Strath Taieri A. and P. at Middlemarch.

7 April—Mackenzie County Highland Show at Fairlie.

12 April—Oxford A. and P. at Oxford.

*19 April—Malvern A. and P. at Sheffield.

* The Department of Agriculture exhibit will be staged at this show.

# Ram Fairs

The following are dates and venues of ram fairs:—

6 February—Canterbury stud at Addington.

13 and 14 February—Canterbury flock at Addington.

14 February—Dannevirke at Dannevirke.

14 February—Ohura at Niho Niho.

5 March—South Otago at Balclutha.

# Main Wool Sales

The dates and venues of main wool sales are:—

**12 and 14 February:** Christchurch.
**19 and 21 February:** Invercargill.
**26 and 28 February:** Dunedin.
**5 March:** Timaru.
**14 March:** Wanganui.
**19 and 21 March:** Auckland.
**26 and 28 March:** Napier.
**2 April:** Wellington.
**21 April:** Christchurch.
**26 April:** Invercargill.
**30 April:** Dunedin.
**15 May:** Wanganui.
**19 May:** Auckland.
**24 May:** Napier.
**28 May:** Wellington.

# Wheat Growing in the Rangitikei

By A. K. BOOTH,
Instructor in Agriculture, Department of Agriculture, Wanganui

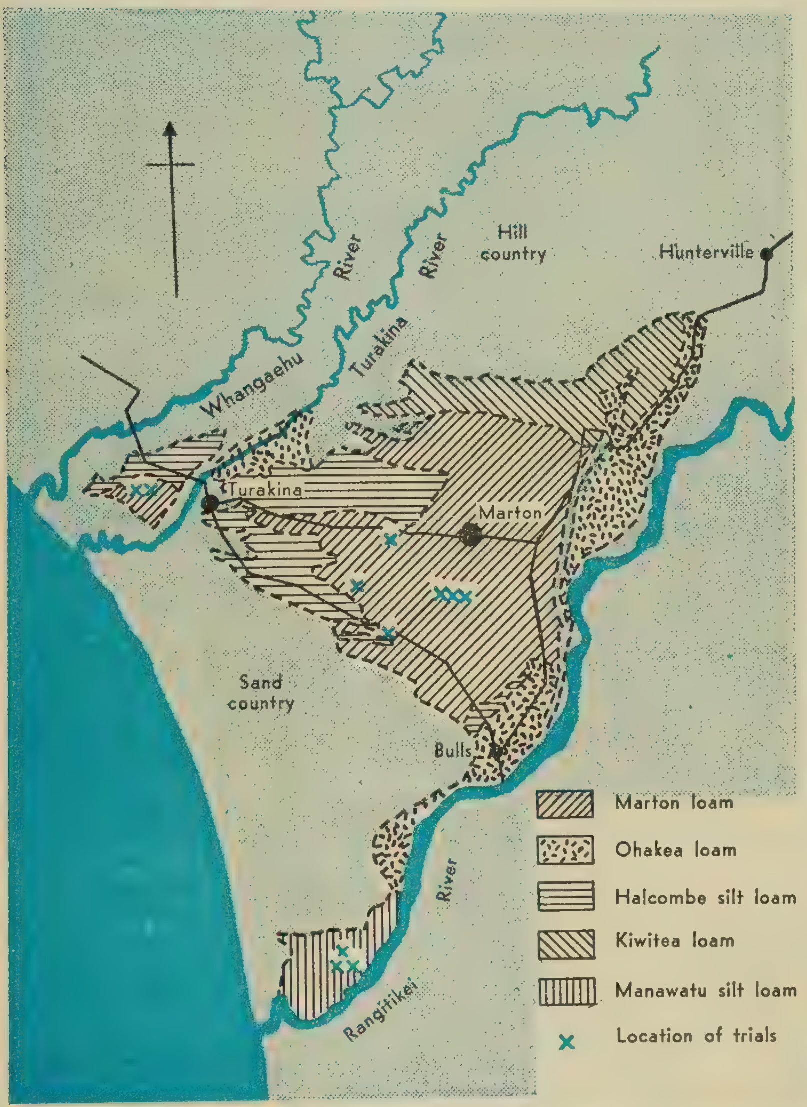
THE Rangitikei is the largest wheat-growing district in the North Island and accounts for more than a third of the North Island wheat acreage. Wheat growing has long been an integral part of farming on the arable land in the district because of its place in the normal pasture renewal programme. Pasture renewal and supplementary winter feed crops are two of the essentials for high carrying capacity. Chou moellier and swedes are grown for winter feed, and after these crops are fed off, the ground is profitably occupied with a wheat crop before it is sown down in new pasture in autumn.

THE trend of wheat acreages in Rangitikei County, the North Island, and the Dominion from 1939 onward is shown in Table 1. These figures are expressed as an average over 4-year periods.

Though the Dominion totals have dropped considerably from 1939 to 1955 (they fall far short of the 350,000 acres of wheat required annually to make New Zealand self sufficient in this commodity), the Rangitikei acreage during this period has been maintained.

TABLE 1—WHEAT ACREAGE FOR RANGITIKEI COUNTY, THE NORTH ISLAND, AND THE DOMINION

| | Rangitikei County | North Island | Dominion |
|---|---|---|---|
| | acres | acres | acres |
| 1939-43 .. | 2,646 | 7,870 | 261,432 |
| 1943-47 .. | 2,092 | 7,217 | 180,032 |
| 1947-51 .. | 2,390 | 7,320 | 135,087 |
| 1951-55 .. | 2,747 | 7,570 | 108,755 |


River
River
Hill country
Hunterville
Turakina
Whangaehu
Turakina
Marton
Sand country
Bulls
River
Rangitikei
▨ Marton loam
▨ Ohakea loam
▤ Halcombe silt loam
▧ Kiwitea loam
▥ Manawatu silt loam
× Location of trials

← Wheat-growing soils of Rangitikei County.

▼ Direct heading wheat north of Bulls. Department of Education photograph.

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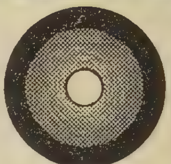

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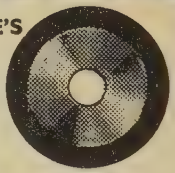

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CROSS 7
TAINUI
GABO

Quick-maturing Tainui and Gabo wheat are the most suitable varieties for the heavy clay soils of the Rangitikei and on the free-draining soils Cross 7 is grown successfully.

## Influence of Soil and Climate

There are about 100,000 acres of land suitable for growing wheat in Rangitikei County. The soil of the main wheat-growing area is the Marton loam, a heavy, dark-grey clay loam topsoil over an impervious clay subsoil. In this soil drainage with moles and tiles is a prerequisite to successful wheat growing.

Two other important wheat-growing soils in the district are the Halcombe silt loam, a soil similar to the Marton loam but more undulating and with a less impervious subsoil, and the Ohakea loam, which is found on the lower plateau country along the Rangitikei River. These soils tend to lie wet during winter and sometimes well into spring, and because of this a quick-maturing, spring-sown wheat is most suitable for the district. Wet and windy conditions prevail periodically throughout the growing season, and a suitable variety of wheat must also be resistant to lodging and shaking.

## Rotation of Crops

The district practice in a normal pasture renewal programme is to take an initial winter supplementary feed crop. Paddocks are ploughed out of old pasture in spring, worked up, and sown to chou moellier or swedes in December, and fed off the following winter. There is then a gap of several months before the new pasture can be sown down the following autumn. Full advantage of this gap can be taken by growing a crop of wheat, and research has shown that good yields can be expected where wheat follows a fodder crop which has been fed off in situ.

By growing a cereal crop advantage is taken of the build-up of fertility, and a quick return provides finance to cover the cost of establishing the new pasture. Where the soil is in very good heart a second crop of wheat can be taken and if this is done, a greenfeed crop of barley or oats is usually grown in the period between the two crops of wheat. The most common sequence of crops is old pasture, chou moellier and/or swedes, wheat, new pasture. When a second crop of wheat is taken the crop rotation is old pasture, chou moellier and/or swedes, wheat, greenfeed, wheat, new pasture.

In the Rangitikei wheat does not grow successfully on ground prepared straight from old pasture.

## Good Cultivation

Good preparation of the seed-bed is very important, and it is often neglected through hasty cultivation. Ploughing should be started as soon as weather and soil conditions permit and should be completed as early as possible in August. Because of the variation in conditions from paddock to paddock and from farm to farm it is difficult to lay down any hard-and-fast rules for cultivation. However, by the judicious use of discs and harrows a suitable seed-bed, firm underneath and rubbly on top, should be prepared for sowing in September.

Care must be taken not to over-cultivate the wheat ground; otherwise a fine tilth on top will pack down hard with the rains that are frequent in September, October, and November, and the growth of the wheat will be retarded.

## Sowing and Seeding

The time of sowing is controlled to some extent by the weather and soil conditions. September is considered the best month for sowing wheat in the Rangitikei and the earlier in September the better. Some wheat crops through force of circumstance have not been sown until October and though quite good yields have been obtained, they have tended to be lower than the earlier-sown crops.

The seed should be drilled at 3 bushels per acre at a depth of 2in.

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The germination of the seed should be known so that an allowance can be made in the seeding rate if the germination is low. The percentage is usually available from seed merchants. If further tests are required, farmers may take advantage of the free seed-testing service provided by the Department of Agriculture's Seed-testing Station, Palmerston North.

Many crops fail because of faulty sowing. Regular checks should be made during sowing to ensure that the rate of seeding is correct.

Seed is often placed too deep in the soil and poor germination results. A heavy drill on a very loose or poorly prepared seed-bed will bury the seed too deeply and care must be taken by the man on the drill to make depth alterations as they are required. On the other hand much seed can be wasted by sowing it too shallow, because seed that is left on or near the surface makes good pickings for the birds. Shallow sowings are mainly caused by travelling too fast when drilling or not running light harrows over the ground behind the drill.

## Fertiliser

The amount of phosphate required with the wheat seed depends on the fertility of the soil. It is unwise to put too much phosphate on very fertile paddocks, especially after a crop of swedes or chou moellier. Tainui, the main variety of wheat grown at present, lodges very badly in too-fertile conditions and heavy applications of phosphate should not be made. The usual practice under average fertility is to put on 1cwt. to 1½cwt. of superphosphate to the acre when sowing the seed.

## Development of Varieties

### Tainui

Since the eclipse of Jumbuck by Tainui in the late 1930s Tainui has been the recognised wheat variety for the Rangitikei district. Jumbuck gave consistently good yields, but it had two undesirable characteristics: It was very susceptible to shaking and on the better-fertility soils it lodged badly.

Tainui was developed from a variety imported from Portugal. It was selected after exhaustive field trials and quality tests with various Portuguese and Spanish varieties by the Wheat Research Institute of the Department of Scientific and Industrial Research in Christchurch. In experimental trials carried out by the Department of Agriculture in the Rangitikei during the 2 years preceding the Second World War, Tainui was shown to be a good-yielding spring-sown wheat which matured early. Tainui was very resistant to shaking and less susceptible to lodging than Jumbuck, and it replaced Jumbuck wholly in the years following.

Extreme lodging of Tainui wheat, typical of the variety in fertile conditions.

Though Tainui was a good replacement for Jumbuck, it showed some bad features which discounted it as being ideal for the district. It yielded very well in the good wheat-growing seasons, but the wet and windy seasons which often occur in the district showed up the weakness of the variety, its tendency to lodge very badly. Besides affecting the growth of the wheat plants, the extreme lodging in wet conditions encouraged stem rust and ear blight and these diseases reduced yields considerably.

### Cross 7

Cross 7 has not proved successful on the heavy clay soils of the district. However, on free-draining soils of the Fern Flats district and the alluvial soils of the lower Rangitikei River, where early preparation and sowing are possible, Cross 7 is grown quite successfully as a spring-sown wheat. It requires a long growing season and to make this possible early cultivation is essential.

### Hilgendorf

Hilgendorf is a premium wheat and is grown in the district to a limited extent. However, in experimental trials and under normal farming conditions the yields of Hilgendorf have not measured up to those of Tainui.

### Gabo

Gabo is a new variety introduced recently into the district. It has shown considerable promise in experimental trials and may ultimately replace Tainui as the standard variety in the Rangitikei. Gabo is a high-yielding, upstanding variety, shorter in the stem than Tainui, and is resistant to both lodging and stem rust. In a normal wheat-growing season Gabo ripens 7 to 10 days before Tainui.

The only undesirable features apparent in Gabo are a tendency to shed a little seed if the crop is left too long before harvesting and the presence of a few immature heads when the bulk of the wheat is mature. However, the advantages of this variety far outweigh the disadvantages. Gabo was introduced from Australia, where it is regarded as a premium wheat.

## Spraying

The spraying of wheat to control weeds has become a recognised practice in the Rangitikei. Most paddocks become infested with weed seeds when the forage crop is grown, and with the early spring sowing of wheat the weeds often establish quickly and their smothering effect becomes a serious danger to the young wheat plants.

It is most important to spray the wheat at the right stage of growth. The wheat should be sprayed at the "flag" stage, that is when the young plants have fully tillered or have six true leaves. If the crop is sprayed before the six-leaf stage, deformed and distorted growth may result and grain yields will be reduced.

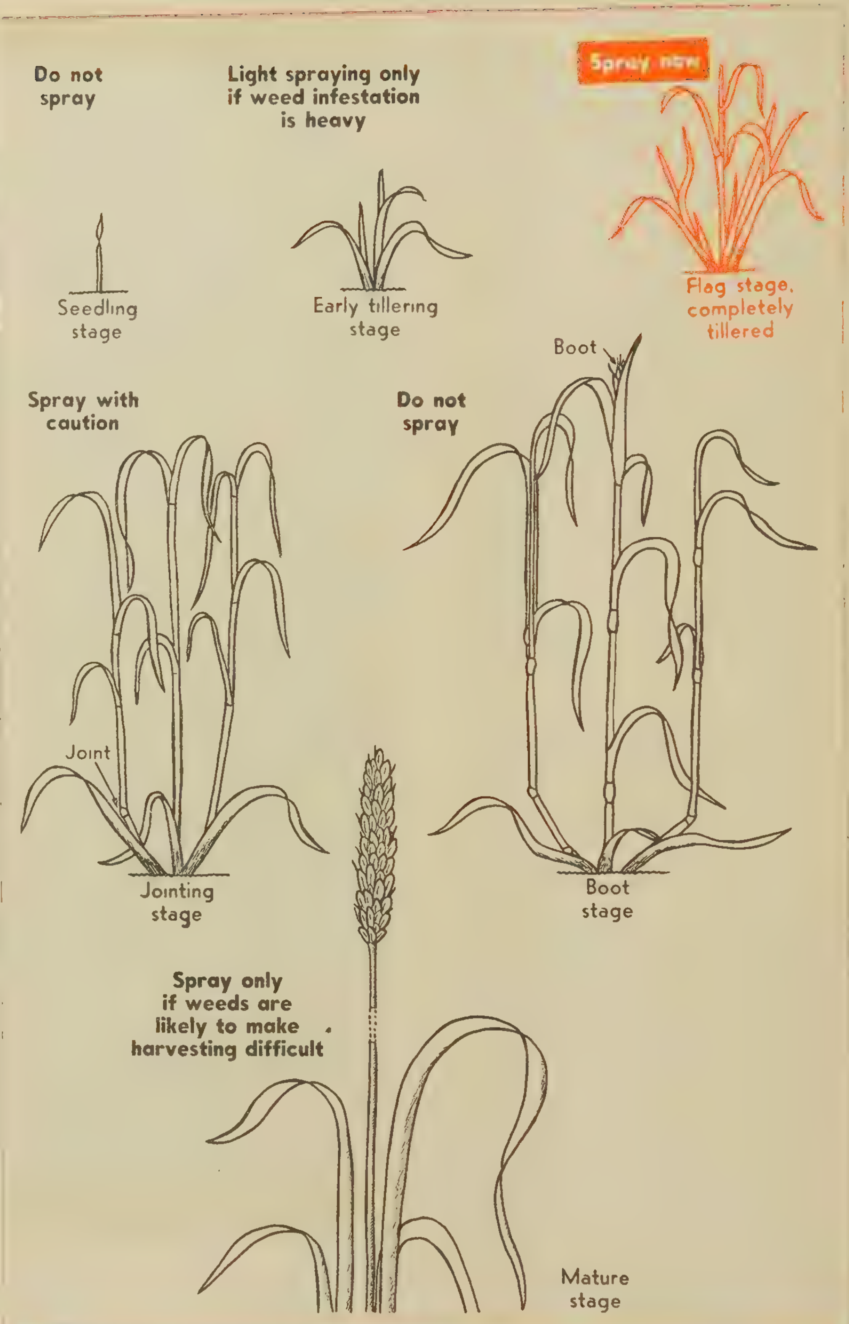
These effects are more pronounced if the amine salt or ester of 2,4-D is used. Light applications of the salts of MCPA at ½lb. per acre can be made at the early tillering stage if a heavy infestation of weeds is likely to choke out the wheat.

If the crop is sprayed too late, that is after the wheat has reached the "boot" stage, considerable damage can be done. The consequent reduction in the head size and the number of grains set will result in lower yields. Wheat that is knocked down by the tractor wheels when it is being sprayed at this late stage does not recover and remains lodged.

In a season when vigorous weed growth is encouraged by wet conditions in January or early February, wheat can be successfully sprayed at the mature stage to dry the weeds off and thus facilitate harvesting.

The most effective sprays used are the water soluble preparations of MCPA, particularly the potassium salt, at up to 1lb. per acre, and the amine salt of 2,4-D at ½lb. to 1½lb. per acre, depending on the weed infestation.

Wheat has been successfully sprayed from the air in the Rangitikei where wet soils conditions have restricted the use of a tractor. Control of weeds in wheat by the use of chemical weedkillers is practical and payable. It increases yields, aids harvesting, and reduces the amount of weed reseeding.


Do not spray
Light spraying only if weed infestation is heavy
Spray now
Seedling stage
Early tillering stage
Flag stage, completely tillered
Boot
Spray with caution
Do not spray
Joint
Jointing stage
Boot stage
Spray only if weeds are likely to make harvesting difficult
Mature stage

Stages of growth of wheat, showing recommendations for spraying for weed control.

## Harvesting

The harvesting season usually begins toward the end of January and may carry on until mid-March. All crops are direct headed with tractor-drawn or combine-type header harvesters.

Weather conditions play an important part in the success of the wheat harvest. Fine, sunny conditions encourage quick maturity and harvesting is relatively straightforward, whereas wet and windy conditions at this time of the year present many problems. Lodging, uneven maturity, regrowth of weeds, and the prevalence of some diseases in wheat can be directly attributed to unfavourable weather conditions. The wheat grower in the

Rangitikei is often faced with these conditions, which, because of reduced yields and poor grain samples, make wheat growing an unattractive proposition. The district average yield is 45 to 50 bushels per acre.

## Certification

Each year some 50 acres of certified Pedigree and Mother Tainui seed is grown in the district to assure an adequate supply of certified seed for growers. The certification scheme is designed to maintain pure varieties free from seed-borne diseases. Each sack of certified seed carries a tag showing the variety and the origin of the seed, and is sealed with the Department's "red" seal. A purity and germination certificate accompanies each line of certified seed and should be examined before seed is bought.

Certified Gabo seed is not available at present, but reselection is in progress to eliminate an undesirable variation in type.

## Wheat Variety Trials

Under a set of conditions peculiar to the Rangitikei it has been extremely difficult to develop a variety of wheat to measure up to local requirements. With the generous co-operation of farmers in the district the Department of Agriculture has carried out extensive wheat variety trials over many years in an endeavour to find more suitable varieties.

Tainui, the established variety in the Rangitikei, has been compared in each trial with many imported varieties and varieties bred and selected in New Zealand. Where a variety showed some promise it was included in further trials until its capabilities and limitations were fully realised. Since 1945 twenty different wheat varieties have been field tested, and during the period 1945-50 the work was mainly confined to four varieties, Tainui, Cross 7, Hilgendorf, and Yielder. (See Table 2 above right.)

In the 1945-46 trial Yielder gave a significantly higher yield than Tainui. In the other trials Tainui always gave a significantly higher yield than either Cross 7 or Hilgendorf and also (except in the 1946-47 Marton trial) a significantly higher yield than Yielder.

In the 1946-47 Marton trial the difference shown between Tainui and Yielder is not necessarily due to any real difference in the two varieties.

The Marton trials were conducted on the Marton loam soil and the Parewanui trials were conducted on the Manawatu silt loam. From 1950 to 1957 16 wheat varieties were tried in experiments. The imported varieties grown in these trials were Gabo, Yalta, and Atle, and New Zealand-bred lines made up the remainder, most of which were Hilgendorf crosses and reselections.

Gabo was the only variety to show any superiority over Tainui in these trials. It possessed some outstanding characteristics which branded it as a probable replacement for Tainui in the Rangitikei. Gabo proved to be a high-yielding variety, equal to Tainui in the good wheat-growing years and out-yielding Tainui in the poor seasons. Gabo has shown resistance to stem rust, it stands well, and is very suitable for direct heading.

TABLE 2—SUMMARY OF RESULTS OF VARIETY TRIALS
(Expressed as bushels per acre)

| | Tainui | Cross 7 | Hilgendorf | Yielder |
|---|---|---|---|---|
| 1945-46 E. G. Friedrich, Marton .. .. .. | 42.6 | — | — | 47.5 |
| 1946-47 J. W. Simpson, Parewanui .. .. | 93.8 | 71.2 | 73.2 | 74.4 |
| 1946-47 E. G. Friedrich, Marton .. .. .. | 59.6 | 46.0 | — | 52.7 |
| 1947-48 J. W. Simpson, Parewanui .. .. | 38.2 | 25.3 | 33.6 | 22.1 |
| 1948-49 E. G. Friedrich, Marton .. .. .. | 70.4 | 45.1 | 45.3 | 48.0 |
| 1949-50 R. A. Simpson, Parewanui .. .. | 34.4 | 23.1 | 13.8 | 17.2 |

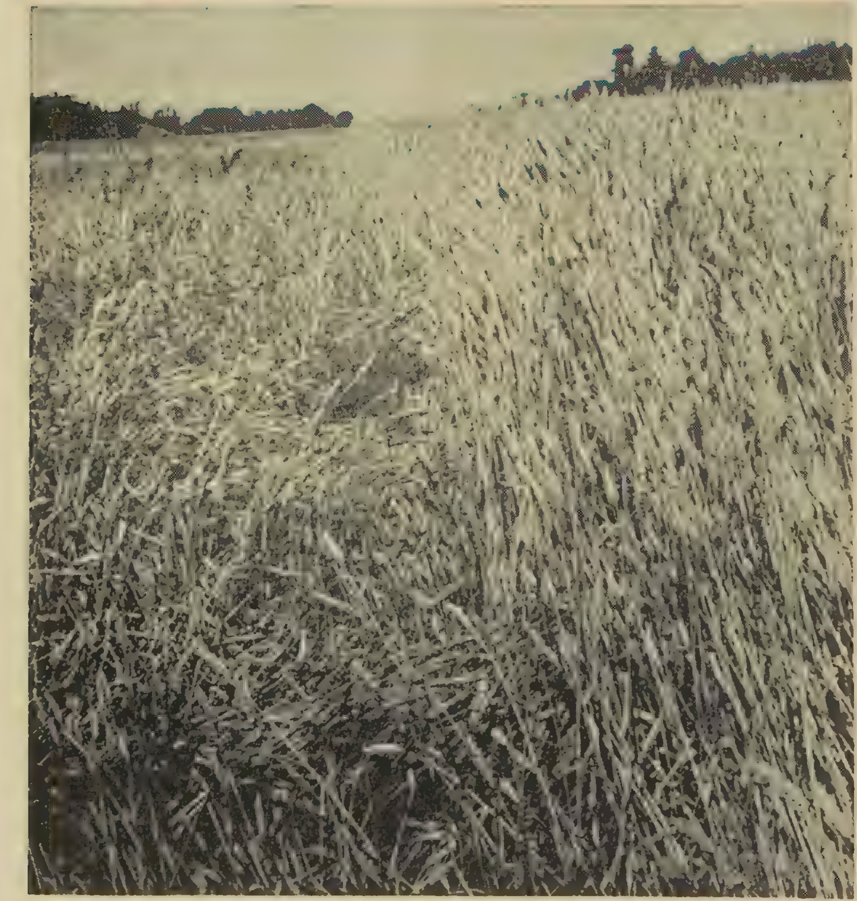
TABLE 3—YIELDS OF TAINUI AND GABO

| | Tainui Bushels per acre | Gabo Bushels per acre |
|---|---|---|
| 1950-51 D. G. McLachlan, Ratana .. .. .. | 54.2 | 56.0 |
| 1951-52 D. G. McLachlan, Ratana .. .. .. | 60.1 | 58.1 |
| 1952-53 J. D. Simpson, Heaton Park .. .. | 31.1 | 33.4 |
| 1956-57 H. A. Nitschke, Bonny Glen .. .. | 47.5 | 64.6 |

Gabo wheat, an upstanding, quick-maturing variety eminently suitable for direct heading.

Wheat growers inspecting the latest wheat varieties in trials at Bonny Glen.

▼ Tainui (left) and Gabo (right). With limited spells of good weather in the Rangitikei an upstanding variety such as Gabo allows quicker and more efficient harvesting.



In 1955-56 on the property of Mr. G. H. Weggery, South Makirikiri, where two blocks were sown, Tainui yielded 40.2 bushels per acre and Gabo 44.3 bushels per acre.

In this series of trials Gabo and Tainui were approximately equal in yield except in 1956-57, when the superiority of Gabo over Tainui was statistically significant.

All of these trials were conducted on the Marton loam soil, which is the main wheat-growing soil in the Rangitikei.

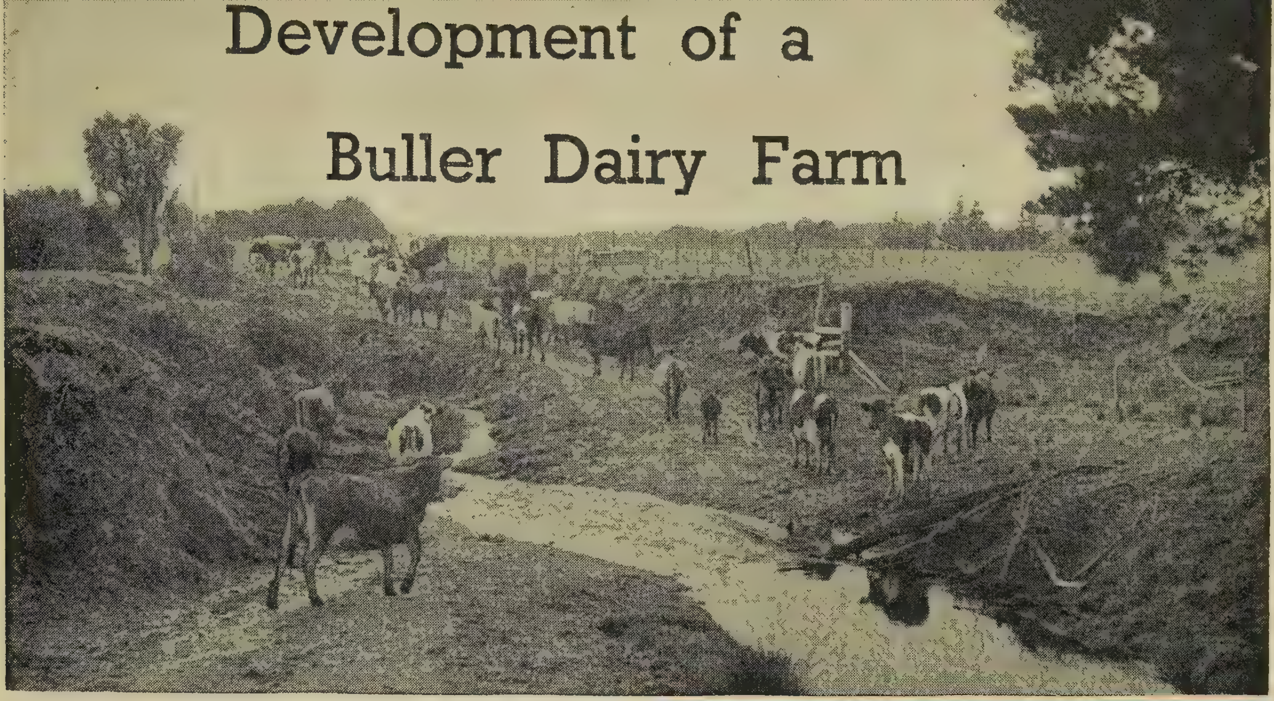
Further experimental work will be conducted with Gabo wheat to assess its full value. These investigations will be to determine the best rate of seeding and the most economic rate of applying phosphate.

## High Potential

A large area of soils in the Rangitikei is suitable for wheat growing, and with the introduction of improved varieties the potential wheat production of the district is high. Farmers of the district realise that high-producing pastures cannot be maintained by topdressing alone. There should be a substantial increase in pasture renewal in the immediate future and a consequent increase in both stock-carrying capacity and the acreage of wheat grown.

Wheat growing undoubtedly plays an important part in Rangitikei farming. Farmers can be assured of a payable cash return by keeping abreast with the development of new varieties and adopting good management practices.

# Development of a Buller Dairy Farm



By P. A. DUNNE,
Fields Instructor, Department of Agriculture, Westport

SOME of the major land development work done in the Buller district has been on the 9000 acres of rich river flats of the Buller Valley, but there is still considerable development and improvement work to be undertaken. This article describes what has been done and the results achieved on one property in the area.

SINCE the decline of gold, coal mining, and timber milling in the Buller district attention has been turned to the development of its soils for farming. Most of the district comprises steep, bush-clad mountains, and farming is confined mainly to the alluvial and sand dune soils of the coastal region.

Unfortunately some soils in this region have proved intractable, these being about 80,000 acres known as the pakihi soils. Pakihi is a Maori word meaning open country, that is, land free from forest. These soils overlie a pan and with the high rainfall their successful drainage is a problem. After some initial work in 1906 by the late B. C. Aston, a chemist of the Department of Agriculture, attempts have been made to develop these soils, and though experimental work is still proceeding, their successful commercial development has yet to be achieved. There are other soils, however, which with draining, liming, and topdressing are capable of carrying good pasture.

When Messrs. W. and J. Marris began milling a section of bush bounding the Orawaiti River the land was heavily covered in native timbers, the chief varieties of which were rimu or red pine (*Dacrydium cupressinum*), miro (*Podocarpus ferrugineus*), rata (*Metrosideros robusta*), and kahikatea or white pine (*Podocarpus dacrydioides*).

The timber industry during its early development was seriously hampered by difficulty of access and freight charges, and consequently only the choicest trees were milled. In later years, with the installation of a bush tramline selected timber farther from the line could be felled, but by 1916 a heavy bush cover still remained and many species, towering up to 80ft. high, had not been touched. It was in this period that a bridge contractor, the late Mr. S. J. Atkinson, first took up for farming the 107-acre property at Orawaiti, Westport, the development of which is described in this article. With the assistance of a brother, Mr. R. Atkinson, some of the remaining timber was felled by contract at £2 5s. per acre, a dry season allowing 59 acres to be cut and burnt.

▲ The 107-acre property today carries a milking herd of 50 cows during early autumn.

▼ Timber like this was first felled, burnt, and later stumped before cultivating and regrassing were done.

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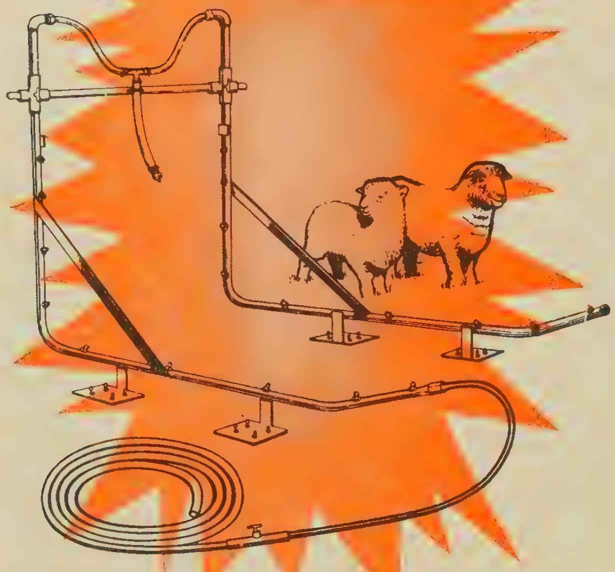

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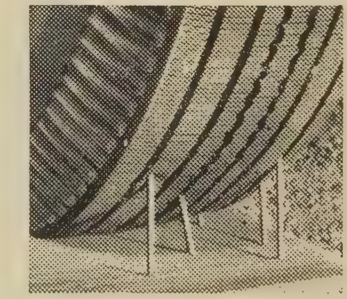

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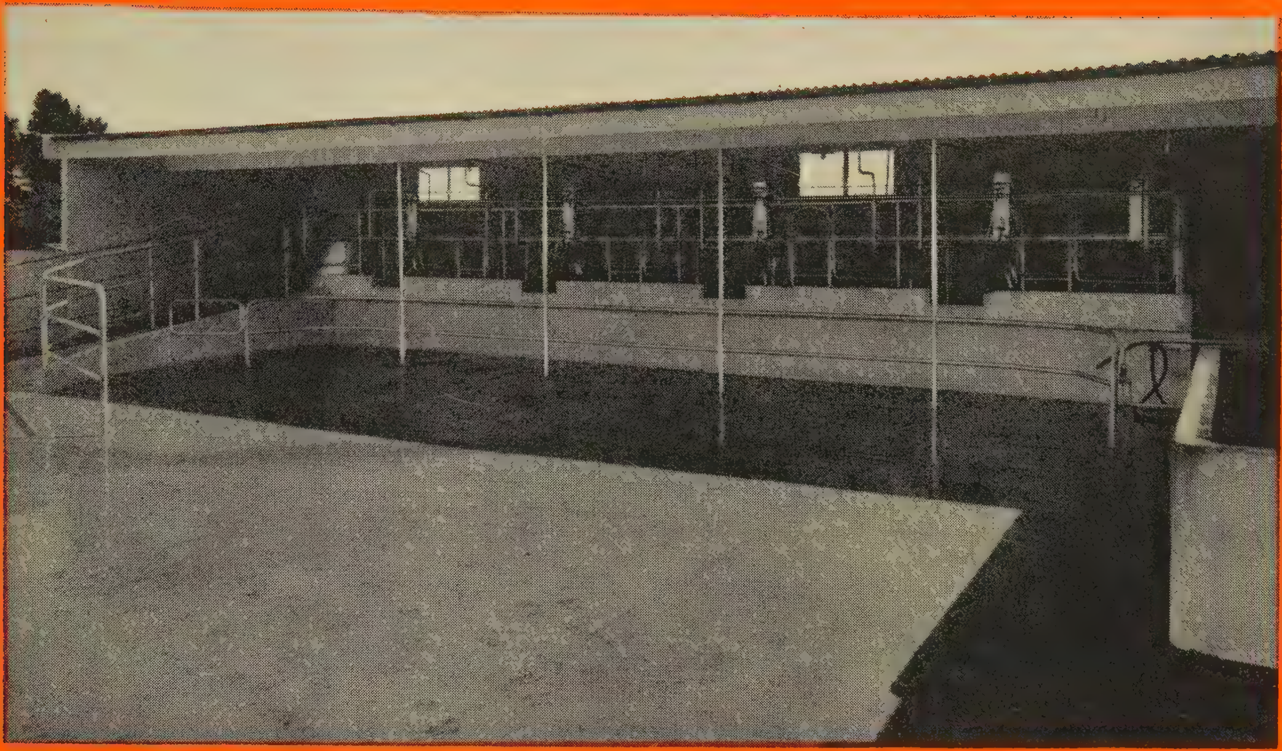
S.L.1

# DEVELOPMENT OF A BULLER DAIRY FARM



Modern raised-bail dairy shed on the property.

Because most of the good timber had been charred, building material for a dwelling, erected in 1918, was obtained from Mokihinui, 30 miles away.

The next stage involved the logging and windrowing of the fallen timber which was done by steam engine and winch at a contract price of £2 per acre. Though felling, burning, and windrowing had resulted in some open ground, stumping operations became important and during the early 1920s 3 acres close to the house received attention.

With laborious hand labour, stump jacks, and steam engines stumping took a considerable time and the 3 acres cost £69 per acre by the time pasture was established.

The high cost of development indicates how heavily the country was timbered.

On the untimely death of Mr. S. J. Atkinson the farm changed hands and a retired mariner, Captain T. Miller, took over, but the property was abandoned in 1931. The potentialities of the land, however, were realised by Mr. F. Scott, who took up the block in 1934. With the help of the present occupier, Mr. H. Bennett, a gradual development programme was started and in 1946 Mr. Bennett bought the farm.

## Development since 1930

When Mr. Scott with Mr. Bennett began farming, the property was very rough, and consisted of 56 acres cleared, 3 acres stumped but growing poor pasture, 10 acres tidal, and 38 acres milled and growing second growth. The dwelling, too, was in very poor condition. Pastures had deteriorated and the land was badly infested with blackberry and gorse, but rough grazing was available for 20 cows. The occupiers began to supply town milk on a private basis and this was continued until the formation of Westport United Dairies Ltd. in 1937. All available money was spent on the development work, and by 1936 20 acres had been roughly stumped and cleared, and by then several smaller areas could be sown.

Drainage became necessary and a system of open drainage was associated with all development work. In conjunction with a farm implement firm the first land clearing demonstration in the district with modern machinery was carried out and about 30 acres were cleared and grassed so that by 1937 70 acres of the 107-acre property could be grazed by dairy stock. The increase in acreage brought with it an increase in stock numbers, and from 1937 to 1946 cream was sold to the Buller Valley Farmers' Co-op. Dairy Co. Ltd., town milk to the Westport United Dairies Ltd., and some fresh cream was sold for ice-cream manufacture.

Development and drainage continued, and with the aid of a "monkey-grubber" a further 15 acres was regrassed. In 1938 the following seeds mixture was being sown:—

| | lb. per acre |
|---|---|
| Certified perennial ryegrass | 25 |
| Italian ryegrass . . . . | 5 |
| Cocksfoot . . . . . . | 5 |
| Timothy . . . . . . . . | 3 |
| Red clover . . . . . . | 2 |
| White clover . . . . . . | 2 |
| *Lotus major* (*uliginosus*) . . | ½ |

By 1938 the property contained 76 acres which had been cleared and grassed, 9 acres of rough grazing (mainly blackberries and rushes), 10 acres of tidal flats, and 12 acres still untouched.

High freight and development costs allowed little for expenditure on fertilisers so that by 1946 much of the cleared land had reverted to poor pasture species, though some effort had been made to maintain the most recently sown paddocks by the application of fertilisers. With the urgent need for regrassing and subdivision, intensive development was carried on only slowly. By laborious hand labour

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An all-weather internal farm road giving access to most paddocks has been a big factor in reduction of pugging of pastures in this high rainfall area. Note the pronounced camber and drainage ditch at side.

and the use of explosives most of the property has been cleared, though about 9 acres have yet to be finally stumped and drained.

## Use of Fertilisers

Because stumping and clearing were considered to be the most pressing needs it was not until 1936 that superphosphate and lime were used in an endeavour to hold sown pastures. Lime became a very important factor in making more productive this naturally waterlogged and sour soil. The following table shows the use of fertilisers during the initial years of development.

**Use of Fertiliser and Lime in Tons per Annum**

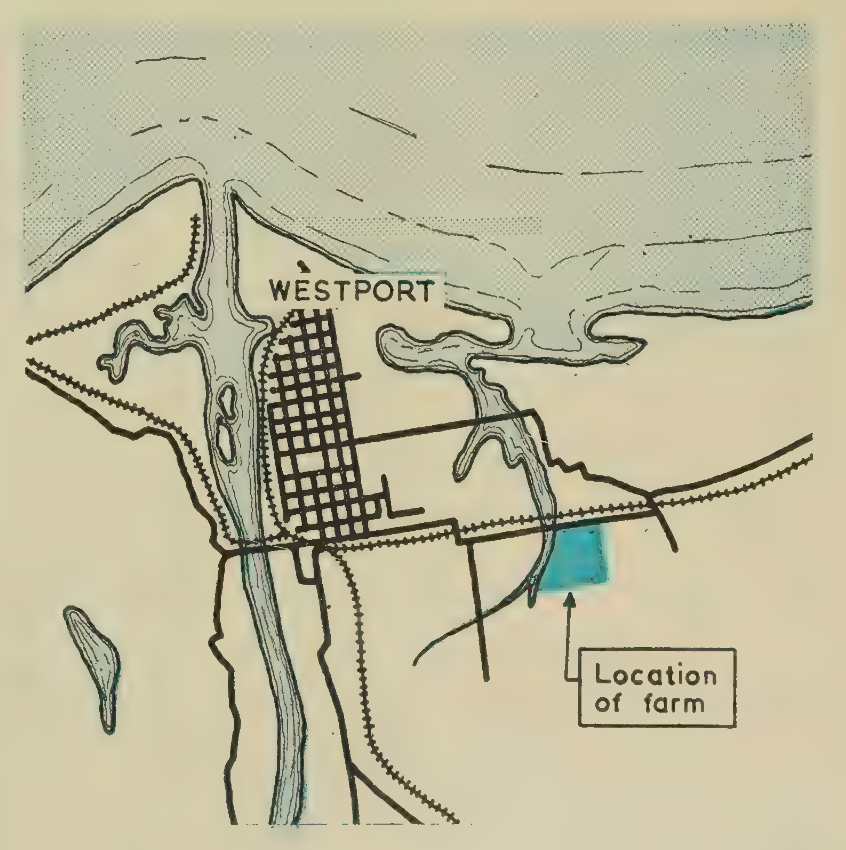
| | 1936 | 1937 | 1938 | 1939 |
|---|---|---|---|---|
| Superphosphate | 4 | 6 | 8 | 7 |
| Lime .. .. | 10 | 16 | 16 | 20 |

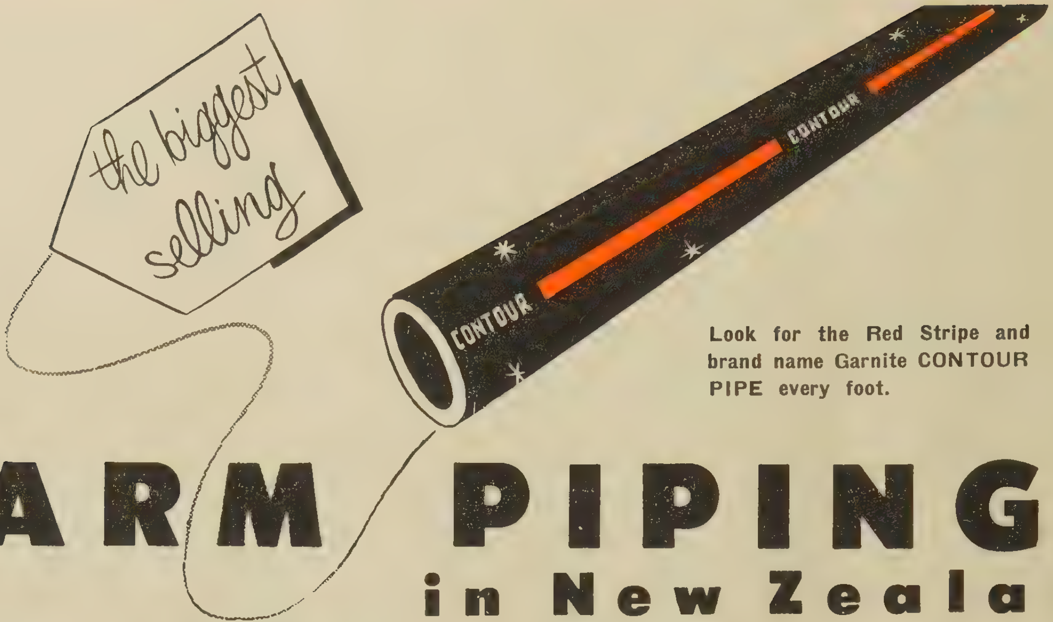
Increased use has continued and today about £100 is spent annually on seeds and fertilisers.

The use of fertilisers has produced better pastures which now demonstrate the potentialities of river silt country in Buller district.

The soils on the property are broadly classified as Hokitika fine sandy and silt loams, but in reality large variations occur.

The addition of lime and superphosphate has done much to improve the





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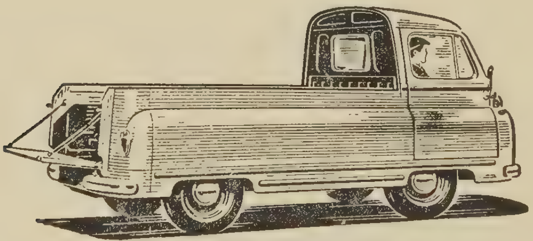

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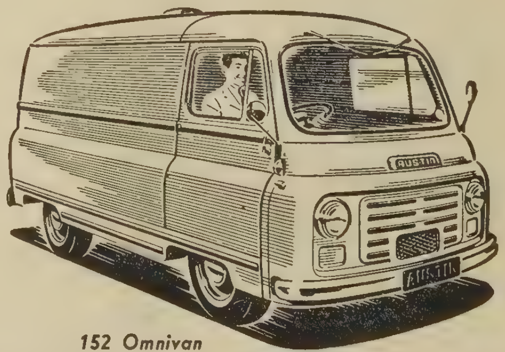


*152 Omnivan*

The property was developed from bush like this.

Pugging is overcome by harrowing, heavy rolling, and oversowing in spring.

An open drain, showing the amount of underground timber.

fertility and the significance of potash is at present being investigated.

On this town milk supply farm topdressing with superphosphate twice a year at 2cwt. per acre each spring and autumn has been found to give an even spread of grass growth and this is now a regular practice.

## Drainage

That clearing and sowing down to good pasture would be of little use in this country without satisfactory drainage is well demonstrated on Mr. Bennett's property. Soils range from sands to heavy silts and gravel. Most of the soils are naturally compact and badly drained with a damp profile throughout, and the use of open drains is necessary to carry the large surface run-off and as a means of catching shifting underground water carried by gravel bars. Now that most of the farm is served with open drains the second stage in a drainage programme has been reached and on some of the most compact soils the mole plough has been used with success. During last season the first tile drains were laid and these are functioning efficiently.

## Development Costs

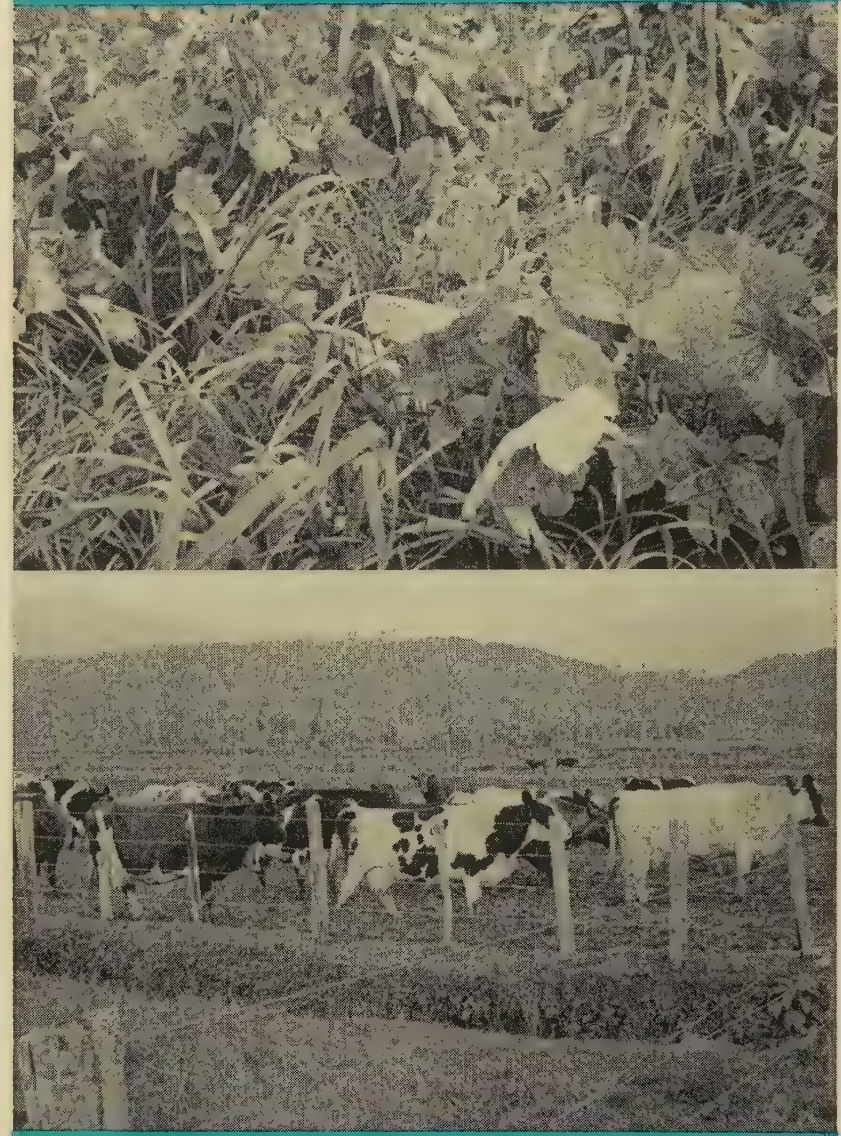
In 1920 the cost of developing 3 acres of cut-over bush country to the pasture establishment stage was £69 per acre. This cost indicates the laborious methods used and it must be remembered that this area, like most bush land, had previously been felled and burnt. In 1952 a 2-acre block of standing green bush was felled and developed at a cost higher than if the bush had been felled previously and some disintegration of the stumps allowed to occur. The following are costs of developing green bush to grass with modern machinery in the Buller district.

| | Per acre | |
|---|---|---|
| | £ | s. |
| Bulldozing | 35 | 0 |
| Contract bush and bog discing | 5 | 0 |
| Seed | 2 | 10 |
| Lime (1 ton per acre) | 2 | 0 |
| Superphosphate (3cwt. per acre) | 2 | 0 |
| Tractor operating costs | 1 | 10 |
| Total | 48 | 0 |

## Production

Over the years production has increased, though this was not regular

DEVELOPMENT OF BULLER DAIRY FARM



Upper—Winter feed: Oats and turnips. Lower—Part of the mixed dairy herd on the property.

during the years when development was of primary importance. The produce sold since 1951-52 is set out below:—

**Produce Sold***

| | Milk gals. | Butterfat lb. |
|---|---|---|
| 1951-52 .. | 24,483 | 1,564 |
| 1952-53 .. | 21,132 | 2,851 |
| 1953-54 .. | 22,645 | 2,097 |
| 1954-55 .. | 18,480 | 2,601 |
| 1955-56 .. | 18,445 | 3,042 |

* Cream for town supply and ice-cream manufacture has also been sold. In some years this has represented a considerable item.

## Stock Policy

In 1934 the farm carried 20 dairy cows, which were in rather poor condition. With the gradual development of the property stock numbers have been increased. Since the farm produces both milk for town supply and butterfat a mixed dairy herd has been carried and Jersey bulls have usually been used. The various avenues used for the sale of products and the need for T.B.-free animals have not allowed the building up of a one-breed herd, but an effort is being made to do this by buying in Jersey bulls with a good butterfat backing.

The 107-acre property now carries a milking herd of 50 cows during early autumn, 19 dry cows and autumn calvers, 6 yearlings, 8 calves, and 2 bulls. Excluding the pigs, a total of 85 head of stock is carried on the 107 acres, but most of these spend much of their time on only 97 acres.

## Improvements

Mr. Bennett advocates good pasture management by the use of the electric fence, harrows, and topdressing, combined with the sowing of certified pasture seeds. An all-weather farm roadway gives direct access to most paddocks and where possible pugging is kept to a minimum. Should hoof damage occur during winter, the paddock is harrowed and rolled in spring and oversown if necessary.

The soil fertility has been raised to a level where special-purpose pastures can now be sown to advantage and a paddock of short-rotation ryegrass with red and white clover has given excellent production for the last 4 years. Until recently surplus pasture growth was conserved as hay or more often as silage and about 20 to 25 acres were cut each year for this purpose.

Because no labour is hired the practice in latter years has been to winter the cattle on a crop, increase stock numbers, and buy in hay. Any surplus feed will be made into hay or silage for use during periods when weather stops pasture growth. Cropping for pasture renewal has been brought about by the need for better pasture species and the excellent results obtained by using short-rotation ryegrass.

During 1955, Mr. Bennett, with the aid of a carpenter, erected a four-bail stoopless dairy shed, which includes innovations such as provision for a refrigerated chamber and the use of a 500-gallon water trough for cleaning. Stoopless milking is a great labour saver and Mr. Bennett now milks the herd on his own, where formerly both he and his wife did the milking. The old dairy shed will be remodelled inside and used for a piggery.

## Future Plans

The property is not yet fully developed, and with subdivision greater production is possible, especially by pasture renewal. Though a creek flows through the property, farm water supply is far from adequate and a water reticulation scheme will be installed in the near future.

Shelter, though now reasonable, must be increased, and on this farm Mr. Bennett is convinced that hedge-type shelter will be the best.

The difficulties of managing and working a one-man farm leave little time for intensified drainage, but more mole and tile drains will be required in the future. Installation of drains will always be a problem because of the large amount of underground timber, but Mr. Bennett is confident that the land justifies expenditure on drainage.

▲ Tall and dwarf varieties.

# Commercial Outdoor Tomato Production in Nelson

By I. L. BROWN,
Horticultural Instructor, Department of Agriculture, Nelson

TOMATOES have been grown commercially in Nelson for over 50 years. Some of the first crops were grown in that part of Nelson City known as "The Wood". This is where most of the tomato glasshouses are now situated. Many small areas of outdoor tomato crops are still grown in this part of the city on sections not taken up with housing or occupied by glasshouses, but the main outdoor crops are grown on parts of the Waimea Plains, at Lower Moutere, round Motueka, and at Riwaka.

IT is estimated that the total area devoted to outdoor tomato production is now 300 acres with a total production of 3000 to 4000 tons. About 1800 tons of fruit are taken by local factories for canning, pulping, sauces, and soups and the balance is sold locally and to markets in both the North and South Islands. Tall (staked) varieties account for the greater proportions of this total, but dwarf types are also grown.

Yields of 20 tons of fruit per acre are not uncommon on the better soils in good seasons, but the average for the district over a period of years is estimated to be about half this figure. Occasionally production overtakes demand for limited peak periods and falling prices make harvesting unprofitable. Diseases and unfavourable seasonal conditions also tend to reduce over-all production.

The warm, sunny Nelson climate with comparative absence of cold, wet periods during the growing season is well suited to tomato growing. Late spring or early autumn frosts limit the season, but the period from October to April, which is usually free of damaging frosts, is sufficiently long for growing good crops of tomatoes.

Dry periods sometimes occur during summer and at times have restricted fruit size, but usually sufficient rain falls for the bulk of the crop to grow to maturity. Irrigation plants have been installed by many growers.

## Soils

In the main the soils used for tomato growing are alluvial, having been built up from the surrounding hills. They are mainly silt loams overlying clay loams or gravelly loams on gravel along the Waimea River at Appleby and Brightwater and on the adjacent flat country at Richmond and Hope. These soils are acid and are naturally low in phosphate and potash.

Crops have been grown successfully on the heavy clay soils of the Moutere Hills, but these areas cannot be considered well suited to commercial tomato production, because of their low fertility and lack of watering facilities. Fertile soils round Motueka, at Lower Moutere, and at Riwaka used for tomato growing comprise silt and gravelly loams. These soils are supplied with phosphate and have a moderate supply of potash by comparison with those already mentioned, having been formed from sources richer in these minerals.

## Varieties Grown

A variety known locally as Halls Stake is the most popular tall strain. Its origin is obscure, but the numerous smooth-skinned, medium fruit borne on typically branched trusses suggest close affinity with some of the well-known English varieties developed by F. Stoner and Sons.

The high-yielding capacity of the plant and a keen market demand for a small-cored, high-quality fruit which packs and carries well and is suitable for both table use and for canning whole have made Halls Stake a firm favourite with Nelson producers. It is so far not grown extensively in other districts and seed is seldom available through trading organisations.

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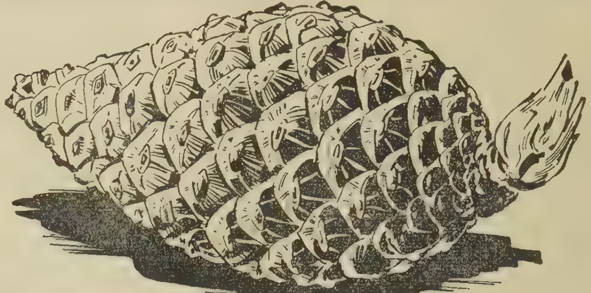

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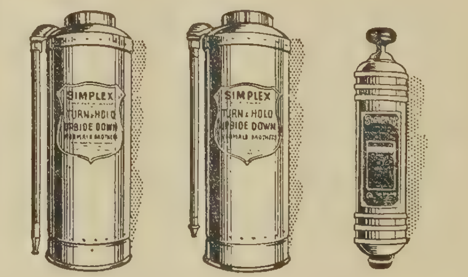

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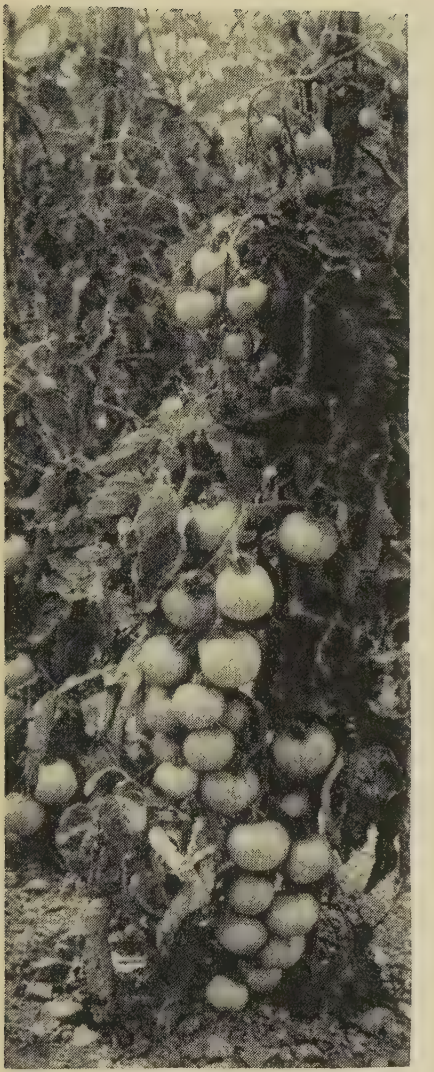


Plant of Halls Stake variety, the most popular tall variety in the Nelson district.

fruit is either allowed to ferment in barrels or drums for a few days or is pulped and treated fresh with hydrochloric acid to break down the gelatinous materials immediately surrounding the seeds. Both methods produce good, viable seed, but the latter ensures a cleaner product and reasonable freedom from virus and other types of diseases likely to be carried on the surface of the seed.

Tall varieties grown in Nelson to a less extent than Halls Stake include Moneymaker and Potentate.

Australian Dwarf Red is the most popular dwarf variety. Small areas of Tatura and Tatinter are also grown.

## Preparation of Soil; Fertilisers

Except for the small areas grown in conjunction with glasshouse crops, most outdoor tomato growing is associated with other farming or cropping. It is usual therefore for tomatoes to be included in a crop rotation which may include pasture, grain, or green peas. For this reason the tomato crop is not often planted in the same area in successive years.

If the same area is to be used for two seasons, a green crop such as lupins or oats is usually grown for working into the soil in the initial preparation.

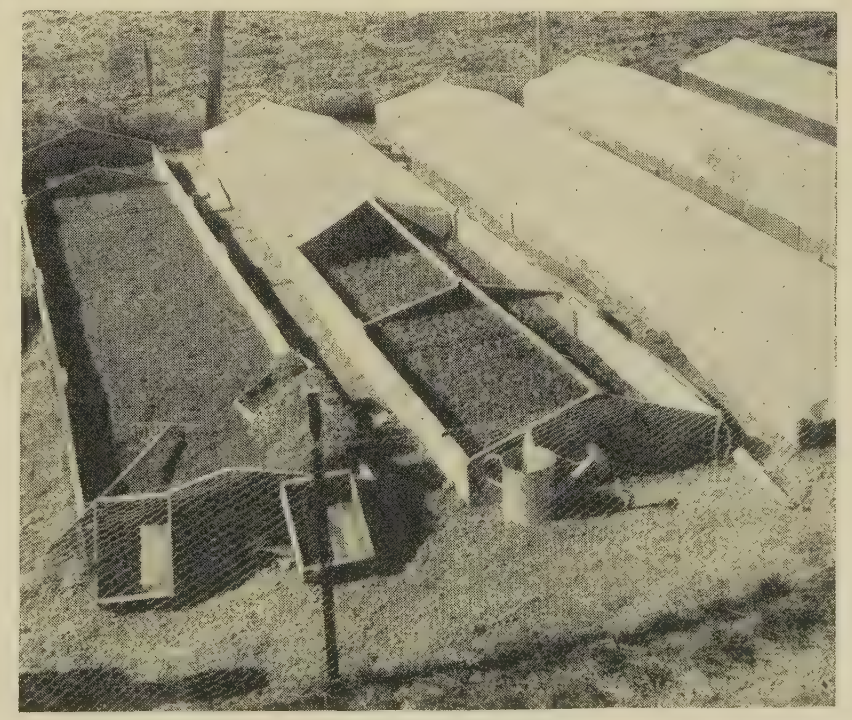
Cultivation begins in early spring as soon as soil conditions are suitable. Many areas are ploughed each way before discing, and cultivation is carried out to bring the soil to a suitable tilth for planting. Liming is not generally included in these initial preparations, as applications have usually been made for the preceding crops such as peas or pasture.

Final preparations include the application of a base dressing of fertiliser when the planting is to be done by hand. If a planting machine is to be used for setting out the plants, the initial dressing of fertiliser is often applied at the side or beneath the rows by the machine at the time of planting.

The fertiliser mixtures used are many and varied. Some growers prepare their own, often to the formula of 3 parts of superphosphate, 3 parts of sulphate of potash, and 1 part each of dried blood, sulphate of ammonia, and nitrate of soda by weight. Other mixtures which find favour because they are readily available and have been found satisfactory are the locally prepared hop, tobacco, and orchard mixtures as well as the tomato mixture. The components, by weight, in 1 ton of these mixtures are:—

| | Superphosphate | Blood and bone | Dried blood | Sulphate of ammonia | Nitrate of soda | Muriate of potash | Sulphate of potash | Magnesite | Dolomite |
|---|---|---|---|---|---|---|---|---|---|
| | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. | lb. |
| Tomato .. | 1,307 | 336 | 224 | 140 | — | 187 | — | 46 | — |
| Orchard .. | 672 | 672 | — | 448 | — | 336 | — | — | 112 |
| *Hop .. .. | 1,155 | — | 303 | 303 | — | — | 479 | — | — |
| *Tobacco .. | 1,200 | 112 | 224 | 100 | 112 | 46 | 246 | 200 | — |

* Several other mixtures are prepared for these crops which vary slightly in their composition.



Outdoor beds used for raising plants from seedlings.

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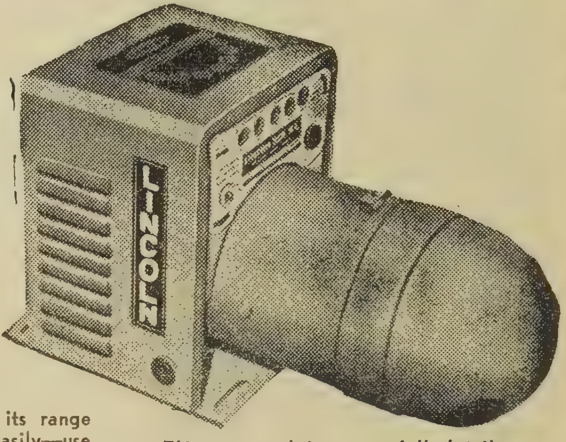

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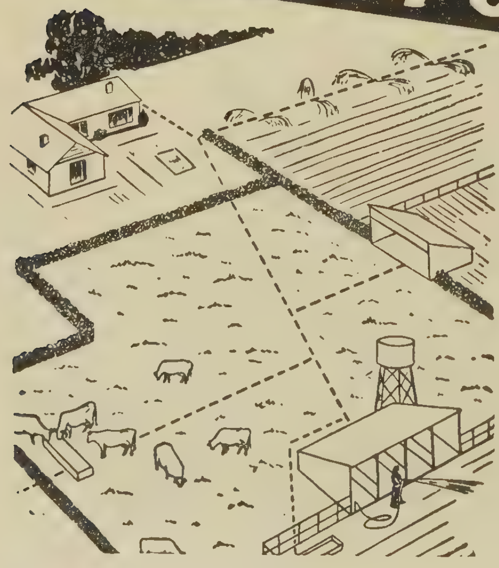

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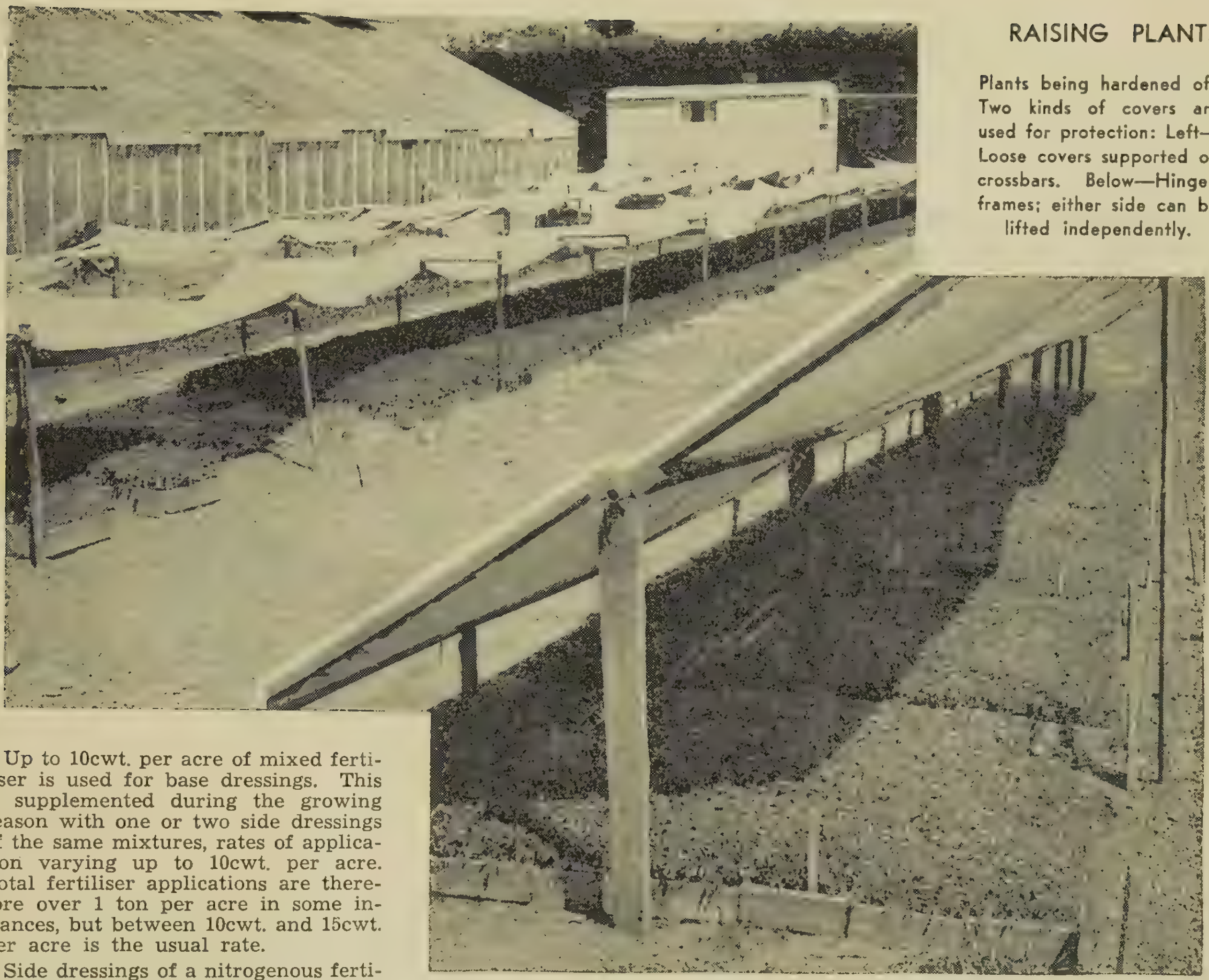

Plants being hardened off. Two kinds of covers are used for protection: Left—Loose covers supported on crossbars. Below—Hinged frames; either side can be lifted independently.

Up to 10cwt. per acre of mixed fertiliser is used for base dressings. This is supplemented during the growing season with one or two side dressings of the same mixtures, rates of application varying up to 10cwt. per acre. Total fertiliser applications are therefore over 1 ton per acre in some instances, but between 10cwt. and 15cwt. per acre is the usual rate.

Side dressings of a nitrogenous fertiliser are sometimes substituted for the mixtures. Practically no use is made of farmyard manure, as sufficient is not available.

In considering the fertiliser practices it must be remembered that the tomato crop usually forms part of a rotation, which undoubtedly assists in maintaining the fertility of the soil and assists with the fertiliser programmes.

## Raising Plants

The bulk of the plants required are raised by nurserymen, who have the facilities for propagation, whereas very few of the growers have propagating houses. Some have small glasshouses where the plants are grown on after germination, but few undertake the raising of the plants from seed.

The plants ready for planting are obtained from the nurserymen in boxes of 30. Those who prick out seedlings and grow them to the planting out stage obtain the seedlings in boxes of between 350 and 750. Young seedlings are pricked out into boxes or beds where they are grown on until planted in the field. The boxes used are the common types of seedling box or 4-gallon tins cut lengthwise. Frames for sheltering the seedling boxes are usually wooden sided 10in. to 12in. high and covered with scrim, cheesecloth, or tobacco cloth, which can be rolled back during the day and warmer periods. The soil in these plant beds is prepared as for seed boxes and is often "maiden" soil from neighbouring river flats. Sand is often added to this soil if it is not itself sandy.

Seed for the first planting is sown during the first week in August and at successively later dates for later plantings.

## Planting

The main planting is usually made about the third or fourth week of October and the later plantings up to mid-November. Late-November plantings are not extensive and are usually harvested after the peak outdoor harvest period (February).

Planting distances vary slightly, but except in the small areas, where closer planting is usual, staked tomatoes are set out 14in. to 18in. apart in rows 40in. apart, allowing about 8000 plants to the acre. Dwarf plants are planted further apart, distances usually ranging from 28in. to 30in. apart in the rows with 40in. to 48in. between rows. Even wider planting of dwarfs is practised, up to 5ft. being left between rows to allow the passage of tractors and larger cultivating implements. The number of dwarf plants to the acre therefore ranges between 4000 to 5500.

The usual planting distance when a planting machine is used is 14in. to 18in. between plants and 40in. between rows for the stake varieties with wider spaces between the plants for dwarf varieties.

For hand planting the rows are marked before the plants are set out by dragging a marker constructed like a very wide-toothed rake along the lines to be planted. Planting machines are of course fitted with a marker which drags a line in the soil for the succeeding row as each row is planted.

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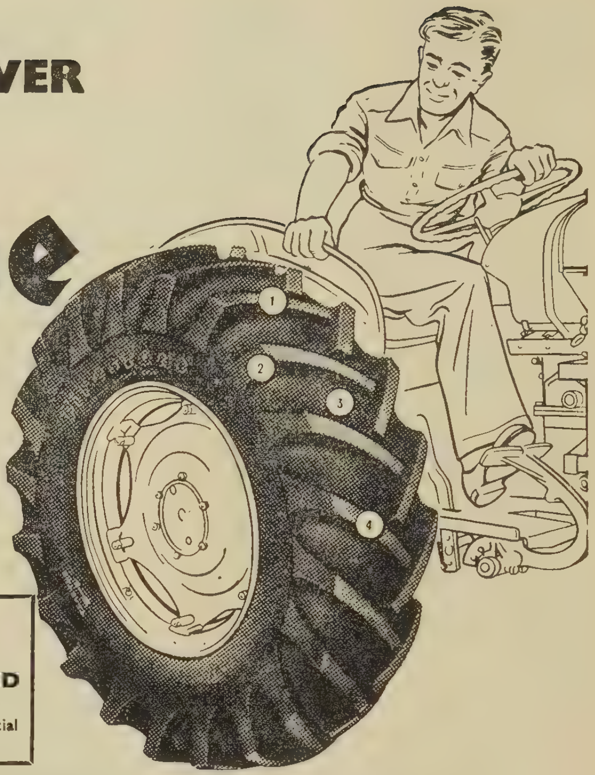

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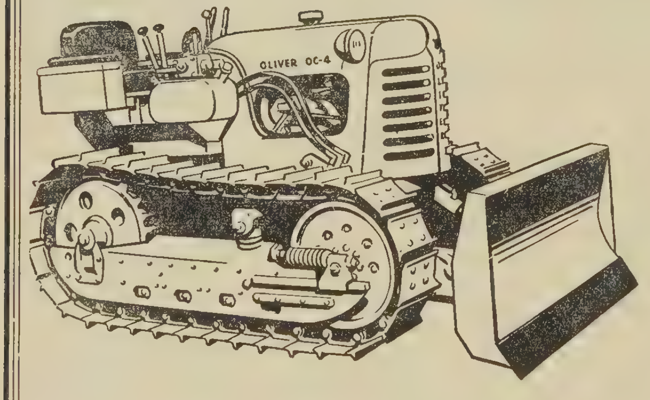

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Plants are well watered in the seed boxes or beds before being lifted for planting. Hand planting is usually done with a trowel, a small plasterer's trowel being favoured by many farmers.

## General Culture

After planting, dwarf varieties receive little attention except cultivation for weed control as long as it is possible for implements to pass along the rows.

Tall or staked varieties receive more attention, as the plants have to be trained and tied to the stakes. Immediately after planting the stakes are thrust into the ground by hand beside each plant. Planting by machine makes it necessary to delay this until after planting, but staking is also usually left until after planting where hand planting is practised to allow ease of movement about the area being planted.

Manuka stakes 7ft. to 8ft. long are almost always used. A length of at least 7ft. is considered desirable, because firm support for the plants is not assured unless the stake can be thrust 10in. to 12in. into the soil. Good manuka stakes are expected to last about 8 years.

The plants are trained as single stems to the stakes with light twine or the short lengths of hemp obtained by unravelling the ends of sacking salvaged from the manufacture of wool packs. Flax stripped into narrow lengths was commonly used, but the short ends of hemp have been found economical and convenient.

Planting tomatoes by machine.

All lateral growths arising from the axils of the leaves are removed during the training and tying operations. Topping of the plants at any given height is not resorted to in Nelson outdoor tomato crops.

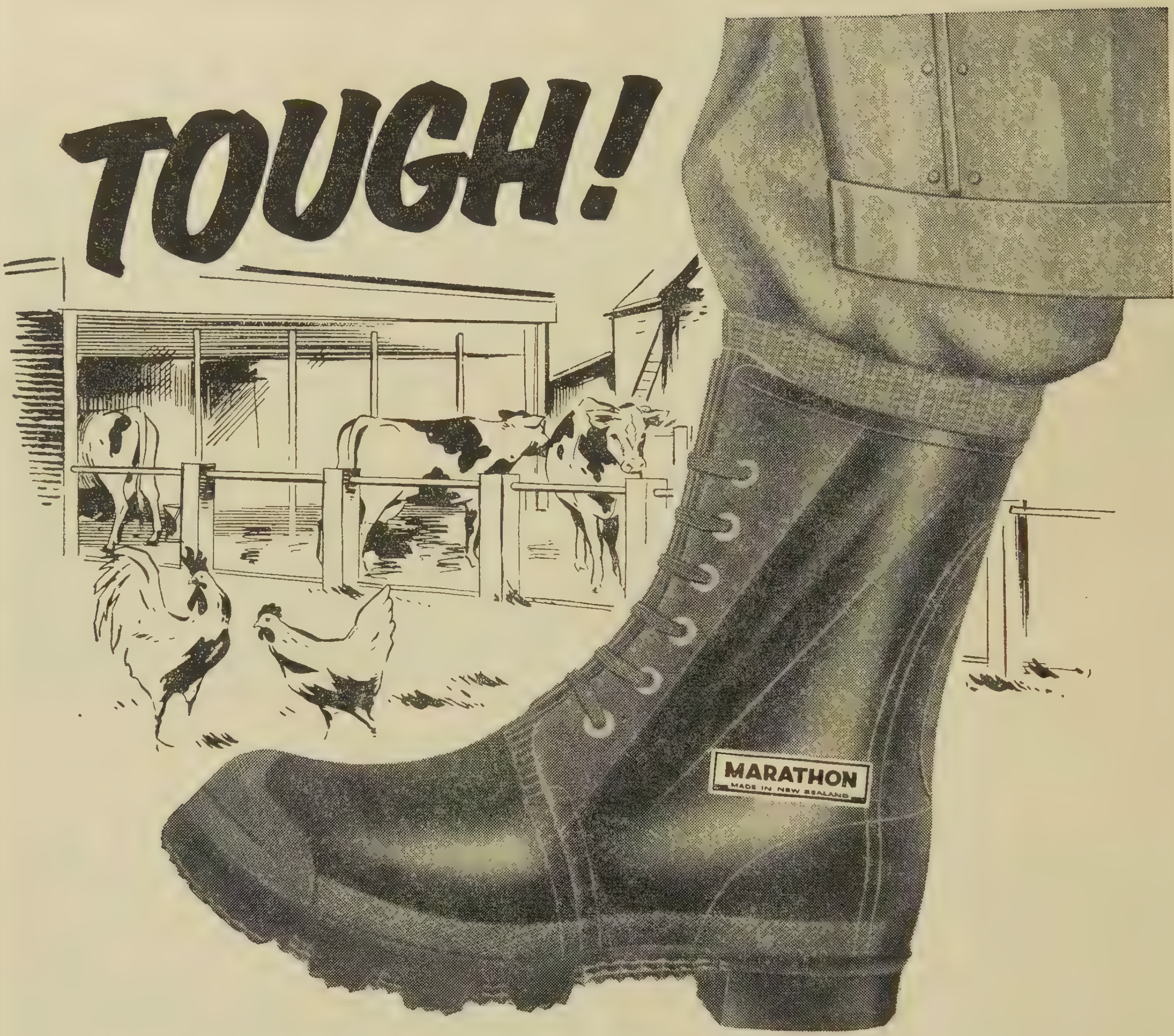
After planting, inter-row cultivation is carried out as required with powered garden tractors to control weed growth. Some hand hoeing along the rows round and between the plants is also practised. If supplementary applications of fertiliser are made, they also form part of the cultural operations during the earlier part of the season, usually during November or December or both months.

## Disease and Pest Control

Sterilised soil is used in the seedling beds for raising a large proportion of the seedlings. After the plants are pricked out and have become established in the boxes or beds it is considered essential to spray the young plants with bordeaux mixture or a copper oxychloride preparation to prevent infection with late blight (*Phytophthora infestans*).

Spraying in the field is usually begun 3 to 4 weeks after planting and continued at similar intervals, especially if wet periods are experienced. Special efforts are also found necessary to control the tomato caterpillar about the time when picking starts.

Spraying dwarf plants with nozzles on boom attached to front of tractor.



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BY SKELLERUP

Irrigation plants have been installed by many growers.

The spraying equipment used ranges from knapsack sprayers or small powered outfits on the smaller areas to the larger conventional type of portable spray rig used in orchards. Long hoses are used to spray down the rows with this latter type of equipment. Some areas of the dwarf tomatoes are also sprayed by outfits mounted on or attached to tractors and fitted with booms carrying the nozzles directly above and to the side of the plants.

**Diseases**

The two diseases most commonly experienced in Nelson outdoor tomatoes are the fungous disease late blight and the bacterial disease tomato canker (*Corynebacterium michiganense*).

Late blight is the most common disease especially during wet seasons and toward the end of the growing season, when climatic conditions are favourable to infection. Control measures carried out by growers include spraying with bordeaux mixture 6 : 8 : 100, copper oxychloride (3lb. to 5lb. to 100 gallons), or colloidal copper (1lb. to 100 gallons).

Severe loss has occurred in some seasons in some plantings from canker. The usual control methods employed have not been satisfactory, but recently the use of "Phygon XL" at 1lb. to 100 gallons has given promise of better control. Clean seed and general garden hygiene have also contributed to a lower incidence of this disease.

Other fungous diseases which occur are septoria leaf spot, sclerotinia, leaf mould, damping off wilts (in seedlings), and botrytis, but special measures are rarely necessary.

Virus diseases such a spotted wilt, tobacco mosaic, and cucumber mosaic also occur frequently, but their incidence never appears to have been serious.

**Insect Pests**

The most serious insect pest experienced is the tomato caterpillar (*Heliothis armigera*). This pest causes damage and loss of fruit during the later part of the growing season if control measures are not carried out. Spraying with a 50 per cent. wettable DDT powder at 1lb. per 100 gallons of water has been found satisfactory by most growers.

Other insect pests that infest Nelson tomato crops are tomato stem borer, aphids, and looper caterpillar. Green vegetable bug, though quite common in and about Nelson City, has not yet been found causing any damage to tomato crops.

## Harvesting

Fruit for shipment to distant markets is picked while still fairly firm and showing little if any red. For supply to processing factories the fruit is picked when fully mature and completely coloured.

The fruit is usually picked into 4-gallon buckets, the picker moving down the rows with one or two buckets, selecting the fruit of the correct maturity from each plant. The filled buckets are taken to the ends of the rows to pathways, where they are tipped into cases for transport to the packing shed.

The sheds of most Nelson tomato growers are equipped with fruit-sizing machines. Those who grow tomatoes in conjunction with fruit use fruit-grading equipment, but these machines are too elaborate for the grower handling tomatoes alone. Sizing machines are mostly of screw or graduated-roller type and consist of a hopper for feeding the fruit to a short sorting table, where the fruit is graded to the standard required. Rollers and belts carry the fruit along until it reaches the point where its size allows it to drop through a slit or opening into the appropriate bin.

Fruit thus sized is packed into cases with 7in. x 7in. x 18in. inside measurement. The average weight of the packed contents is 20lb. to 22lb., depending on the size of the fruit. Cases are branded or labelled with a grade mark indicating quality, weight, and shipping mark before being dispatched to market.

Shipment to markets outside Nelson entails road, rail, and sea transport. Tomatoes for southern markets are sent by road to the rail heads at Blenheim or Inangahua Junction. Shipments to North Island markets are transported by small coastal vessels to Wellington and thence by road or rail to the various fruit markets in the Wellington area and other centres in the southern part of the North Island.

Fruit for processing factories is usually carried direct by road from field to factory in loosely filled cases containing between 50lb. and 60lb.

Except for a few small areas where early planting is practised harvest of outdoor tomatoes usually begins with light pickings in or just before mid-January. The bulk of the crop is picked during February and early March, the end of February and March being the period when most of the fruit for processing is harvested. In favourable years harvesting of late and main crops extends into April.

◆

# A Hive Barrow Aids Handling of Hives and Supers

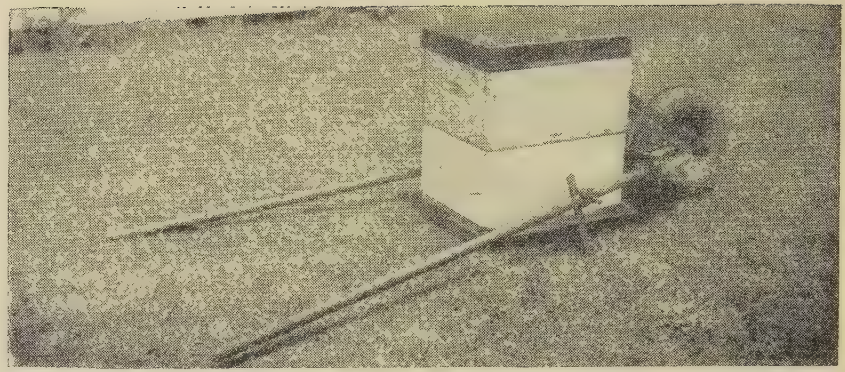
By D. ROBERTS,
Apiary Instructor,
Department of Agriculture,
Auckland

COMMERCIAL beekeeping entails much heavy physical labour. The lifting involved in moving hives in the apiary and loading and unloading hives and heavy supers of honey on and off motor vehicles is extremely arduous and beekeepers are constantly seeking methods which will help to reduce the physical effort required. This article describes a hive barrow devised by a North Auckland beekeeper to lighten this work.

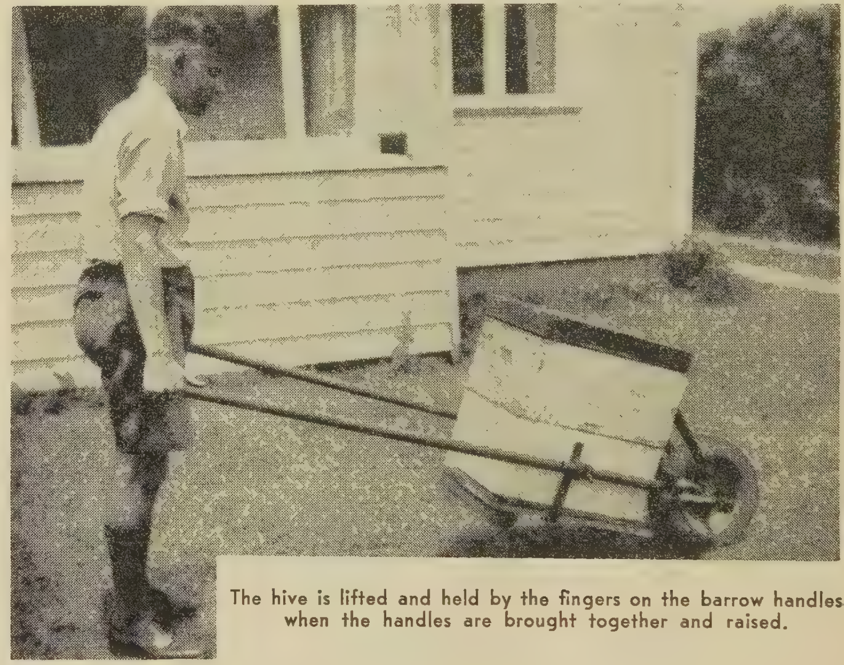
MOST commercial beekeepers owning up to 400 hives operate as one-man units. The work of moving apiaries and handling and removing the honey supers is most arduous when done single handed, and any simple device which will ease this work must be of considerable assistance.

A hive barrow, designed and constructed by Mr. W. I. Haines, of Kaitaia, by enabling hives and honey supers to be wheeled on to the deck of a truck, eliminates much of the heavy lifting of shifting apiaries and removing the honey crop. With this barrow it is possible for one man to shift colonies up to four supers high or to remove and load a honey crop with greatly reduced effort.

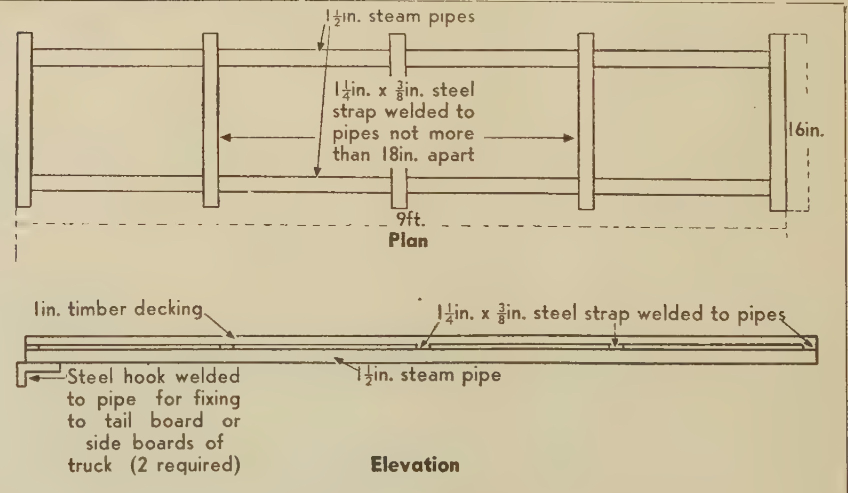
When colonies are being moved it is not necessary to lift the hive in any other way than with the barrow. The hive is screened and the barrow positioned so that the handles are on each side of and parallel with the lengthwise dimension of the hive. The handles are then lowered so that a pair of free-swinging fingers or clamps come under the bottom board of the hive. Raising the handles causes the clamps to grip the bottom board securely and the hive can then be wheeled away and up a ramp on to the truck. When the barrow is on the truck the handles are lowered and the fingers automatically release the load. Because of the length of the handles no difficulty is experienced in pushing the barrow up the ramp.



The barrow in position to lift a hive, showing the clamps (fingers) on the handles lying free.

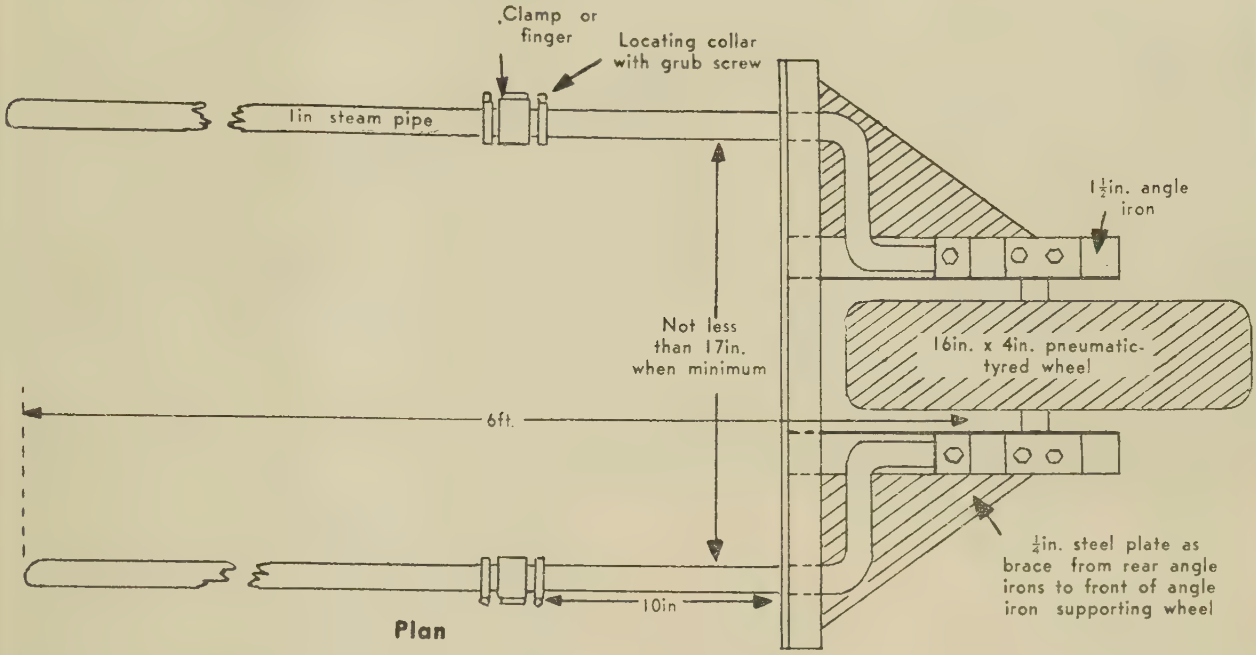


The hive is lifted and held by the fingers on the barrow handles when the handles are brought together and raised.

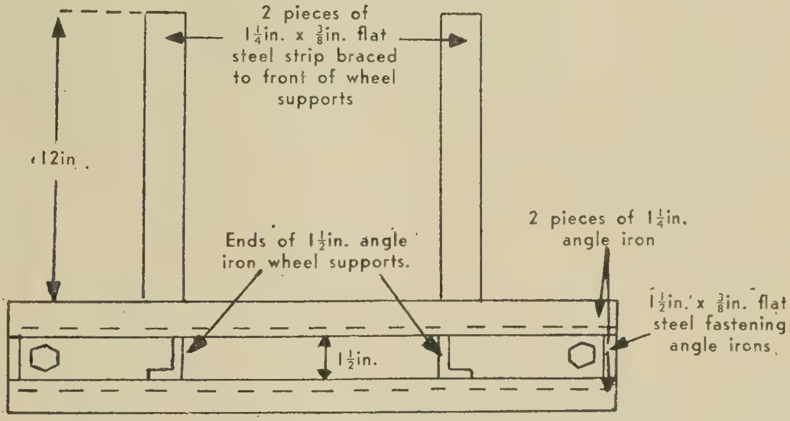

1½in. steam pipes
1¼in. x ⅜in. steel strap welded to pipes not more than 18in. apart
16in.
9ft.
Plan
1in. timber decking
1¼in. x ⅜in. steel strap welded to pipes
Steel hook welded to pipe for fixing to tail board or side boards of truck (2 required)
1½in. steam pipe
Elevation

Construction of the ramp.

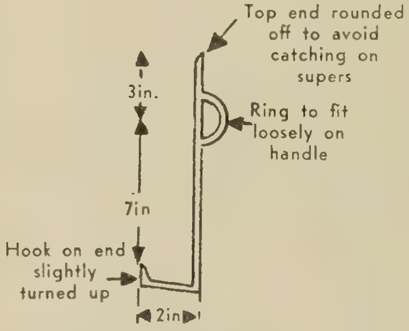
# CONSTRUCTION OF THE BARROW


Clamp or finger
Locating collar with grub screw
1in steam pipe
1½in. angle iron
Not less than 17in. when minimum
16in. x 4in. pneumatic-tyred wheel
6ft.
¼in. steel plate as brace from rear angle irons to front of angle iron supporting wheel
10in

**Plan**


2 pieces of 1¼in. x ⅜in. flat steel strip braced to front of wheel supports
12in.
Ends of 1½in. angle iron wheel supports.
2 pieces of 1¼in. angle iron
1½in. x ⅜in. flat steel fastening angle irons
1½in.

**View from handles**


Top end rounded off to avoid catching on supers
3in.
Ring to fit loosely on handle
7in
Hook on end slightly turned up
2in

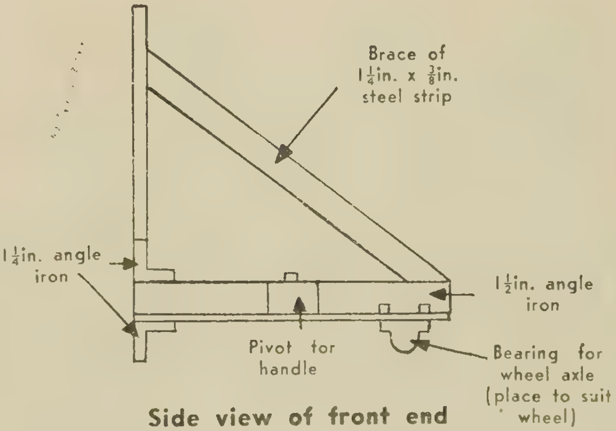
**Clamps or fingers of 1in. x ¼in. steel strip (2 required)**

## The Ramp

The ramp is simply constructed of 1in.-thick planks fastened to two lengths of 1½in. iron steam pipe cross-braced with strips of 1¼in. x ⅜in. steel strap at 18in. intervals. At one end of each iron pipe braces a piece of 1¼in. x ⅜in. steel strip is welded and then bent at right angles to form a grip which will hold the ramp to the truck deck. The length of the ramp is governed by the height of the truck deck, but it should not be less than 6ft. and preferably 9ft. If the truck can be so placed that the rear wheels are in a depression in the ground, the incline of the ramp can be greatly reduced.

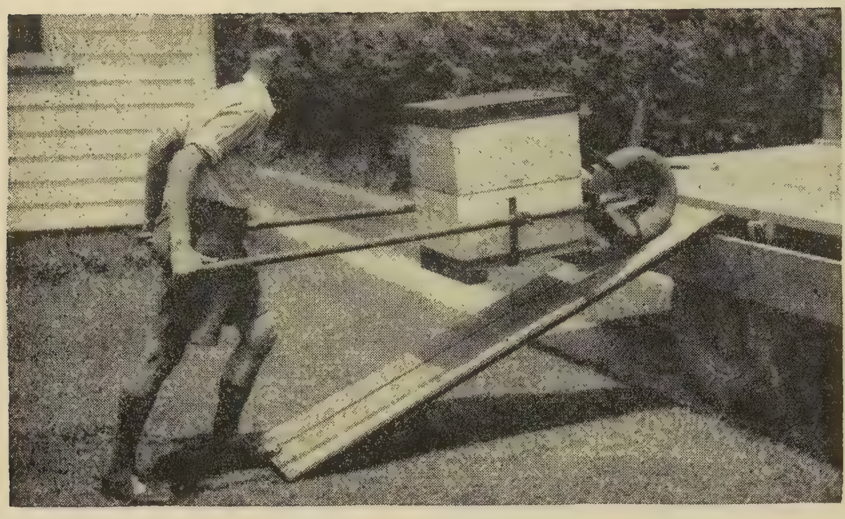
## The Barrow

The barrow is substantially constructed. The handles are formed from two pieces of 1in. steam pipe each 6ft. 6in. long. Both handles are offset about 3½in. outward at a point 4in. to the rear of the pivot point. When the offset is made the over-all length of the handles will then be approximately 6ft.


Brace of 1¼in. x ⅜in. steel strip
1¼in. angle iron
1½in. angle iron
Pivot for handle
Bearing for wheel axle (place to suit wheel)

**Side view of front end**

## A HIVE BARROW



The barrow and a hive being wheeled up the ramp on to a truck.

The frame which carries the wheel and to which the handles are attached is substantially constructed of 1¼in. and 1½in. angle iron well braced with 1¼in. x ⅜in. steel strip and ¼in. steel sheet. The heavier (1½in.) angle iron is used to form the front members, which support the 16in. x 4in. pneumatic-tyred wheel, and the 1¼in. angle irons are used to form the cross member, through which the handles pass. Bolted or welded to this cross member are two pieces of 1¼in. x ⅜in. steel each projecting 12in. above the cross member. These provide support for the supers of the hive when the barrow is lifted. Two 1¼in. x ⅜in. steel braces run from 2in. below the tops of these uprights to the front end of the forward members. The cross member is made so that there are openings 1½in. wide between the angle irons through which the handles can pass. These openings should not be less than 6in. long to allow for ample sideways movement of the handles.

The front member is further braced throughout its length by pieces of ¼in. steel sheet running from the outer ends of the cross member to the outer ends of the front member. The wheel should be so placed that the tyre has 1in. clearance between its tread and the cross member.

The pivots for the handles can be placed immediately behind the wheel bearing or at any position which will allow clearance for the offset. The fingers or clamps should have the upper ends on the inner sides chamfered toward the outside so that they will not catch on supers or hive bodies. The rings, which are welded to the fingers, must be a loose sliding fit on the handles if they are to function freely. To give a really secure grip on floor boards or supers the 2in. hooks formed on the lower ends of the fingers should be slightly inclined upward.

This barrow is particularly useful for loading hives or supers of honey in apiaries where the site does not allow free movement of a motor vehicle. When the barrow is used for removing the honey crop handling of supers of honey will be greatly facilitated if, when they are removed from the hive, they are stacked on trays or pallets similar to those used in comb-warming rooms.

### Materials Required

Materials required for the barrow are:—

1 standard 16in. x 4in. pneumatic-tyred barrow wheel and axle
2 lengths of 1in. steam pipe, each 6ft. 6in.
2 pieces of 1½in. angle iron, each 15in.
2 pieces of 1½in. angle iron, each 2ft. 2in.
1 piece of ¼in. steel sheet, about 8in. x 12in., to be cut diagonally for braces.
7ft. of 1¼in. x ⅜in. steel strip
2 gudgeons for wheel bearing
4 collars, nuts, and bolts

Required for the ramp are:—

2 pieces of 1½in. steam pipe, each 9ft.
8ft. of 1¼in. x ⅜in. steel strip
16ft. of 8in. x 1in. timber

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## Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during October 1957 and for the 3 months ended 31 October 1957 with comparative figures for the same month and the 3 months of 1956 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

**BUTTER**

| Period | Creamery (tons) | Whey (tons) | Total (tons) | Percentage Inc. or dec. |
|---|---|---|---|---|
| October 1957 .. .. .. .. | 25,566 | 404 | 25,970 | — |
| October 1956 .. .. .. .. | 23,098 | 404 | 23,502 | — |
| Increase or decrease .. .. .. | +2,468 | — | +2,468 | +10.501 |
| 3 months ended 31/10/57 .. .. | 54,749 | 783 | 55,532 | — |
| 3 months ended 31/10/56 .. .. | 48,446 | 763 | 49,209 | — |
| Increase or decrease .. .. .. | +6,303 | +20 | +6,323 | +12.849 |

Butter in store at 31 October 1957 was 21,592 tons

**CHEESE**

| Period | White (tons) | Coloured (tons) | Total (tons) | Percentage Inc. or dec. |
|---|---|---|---|---|
| October 1957 .. .. .. .. | 10,446 | 1,904 | 12,350 | — |
| October 1956 .. .. .. .. | 10,129 | 1,682 | 11,811 | — |
| Increase or decrease .. .. .. | +317 | +222 | +539 | +4.564 |
| 3 months ended 31/10/57 .. .. | 18,223 | 3,039 | 21,262 | — |
| 3 months ended 31/10/56 .. .. | 17,782 | 2,098 | 19,880 | — |
| Increase or decrease .. .. .. | +441 | +941 | +1,382 | +0.695 |

Cheese in store at 31 October 1957 was 9,511 tons

If these figures are converted into butterfat equivalent, there is an increase of 11.941 per cent. in butterfat graded for the 3 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

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## View of Fatal Tractor Accident

**Tractor Drivers—**

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Remember it is the accident that doesn't happen that saves lives.

## Recent Research Work

# TUSSOCK GRASSLAND

**DETAILS of initial results on the Broken River trial area, located at 2350ft. in the Waimakariri catchment, appeared in the December 1955 (pages 554 and 555) and September 1956 (pages 277 to 283) issues of the "Journal". These notes summarise progress of some of these experiments to date.**

INVESTIGATIONS include three methods for improving deteriorating fescue tussock swards by seeding and fertilising: Seeding undisturbed tussock associations by either surface oversowing or subsurface drilling; oversowing or drilling swards after a minimum of surface cultivation, and sowing in ploughed and cultivated seed-beds.

**SURFACE SEEDING** SPRING oversowings on undisturbed cover, simulating aerial oversowing, produced satisfactory strikes of clovers (red, white, and alsike) but poor establishment of grass species (cocksfoot and ryegrass) in 1953-54, 1954-55, and 1955-56. Except in 1954-55 the establishment of oversown clovers was less uniform and not as dense as with subsurface seeding methods, and it has taken three seasons for oversown clovers to attain comparable density and production. Original tussocks have persisted and improved in vigour except where areas have been overgrazed.

**SUBSURFACE SEEDINGS** Subsurface introduction of seed and fertiliser into undisturbed tussock swards by grassland-tip drilling resulted in quick, reliable, and uniform establishment of clovers each year and proved outstandingly better than oversowing in two out of three seasons. Grass establishment in drilled plots was little evident initially, but both cocksfoot and ryegrass appeared in increasing proportions during the third spring and fourth autumn after sowing—presumably responding to improved soil fertility arising from vigorous clover growth and the nitrogen returns from animal grazing and to continued topdressing with phosphate, sulphur, lime, and molybdenum.

**SEEDING IN SURFACE CULTIVATION** Where seeds and fertiliser were oversown and rolled on a pitchpole-harrowed surface initial density and uniformity of clover establishment were intermediate between those obtained with oversowing and subsurface drilling in undisturbed cover. The initial grass establishment (mainly cocksfoot) was poor, and though improvement has occurred, the proportion of grass in these plots is not as good after three seasons as where it has been introduced by grassland-tip drilling.

Where seed and fertiliser were drilled into a harrowed surface both clovers and grasses established very well, the result being better than that obtained from either oversowing or drilling on undisturbed or slightly disturbed ground cover.

Harrowing removed 25 to 50 per cent. of the existing tussocks.

**CULTIVATED SEED-BEDS** Sowing in ploughed and cultivated seed-beds has been carried out each year since the spring of 1954. This method gives much more even establishment of sown species, especially grasses, than any of the foregoing methods with which seed and fertiliser are introduced on or into virgin tussock cover. Clovers also establish satisfactorily—provided the initial grazing is not unduly delayed—and they tend to become the dominant sward component after the first growing season when pastures are sown out of virgin tussock land. When sown after the second ploughing and after temporary pasture and/or fodder crop rotations grasses appear to establish and persist more readily.

**METHODS OF SOWING** Three methods of sowing on cultivated ground have been investigated: Drilling in 7in. rows, drilling in 3½in. rows, and surface broadcasting and rolling.

Drilling in 7in. rows gave consistently good, even strikes of grasses and clover, but bare inter-row spaces still persist after three to four seasons; 3½in. drilling also gave good, even establishment and much better initial ground cover provided the seed-bed was free of surface trash and was firmed by rolling before and after drilling. Any surface trash is liable to cause coulter blockage at the narrow spacing, and if the surface is light and fluffy and lacks consolidation, patchy strikes result. Clovers do better in competition with sown grasses when establishing in 3½in. sowings than in 7in. sowings.

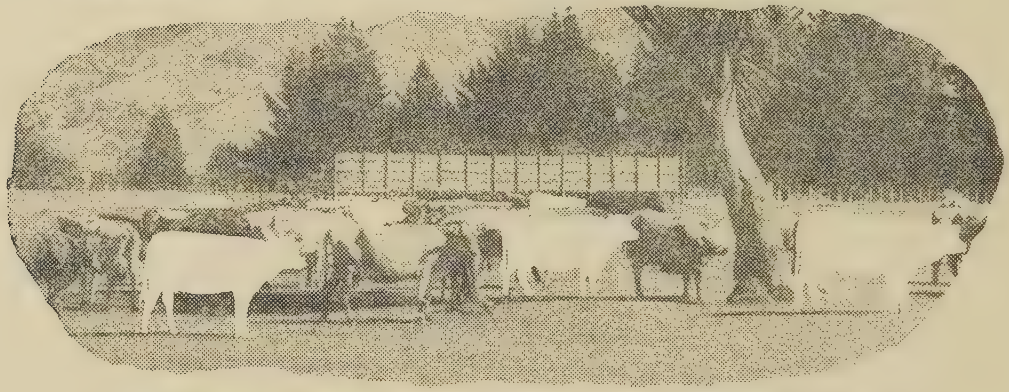
Surface broadcasting and rolling in of seed on a prepared seed-bed gave much more uneven establishment than either of the drilling methods in the one season in which all three methods were compared.

**WINTER FALLOWING** Fallowed soils in high country areas are subject to the risk of wind erosion. This risk is greater with summer fallows than with winter fallows, and in all seasons since 1954 when winter fallowing has been adopted in the Broken River trial area no appreciable soil losses have occurred through winter fallowing. To ensure minimum loss it is essential, however, that apart from rolling on the furrow, top working of the fallowed area should be delayed until immediately before the area is sown down.

Winter fallowing of country ploughed directly out of tussock has conferred a number of advantages including earlier and easier spring cultivation and earlier sowing and more uniform establishment of swards, with up to 30 per cent. greater herbage production during the initial 6 months' growth. Swards sown after winter fallow also tend to remain relatively weed free longer than those established without the benefits of the fallow.

—*L. D. BASCAND*

Gorse on your land . . .



gaps in your herd !

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# Differential Locks in Farm Tractors

By C. M. B. OLIVECRONA,
Machinery Instructor,
Department of Agriculture,
Wellington

DIFFERENTIAL locks are now being fitted to some makes of British farm tractors and their use and function are worth brief study. The function of the differential lock is to lock the two halves of the rear axle into a solid, unified drive for both rear wheels and to give improved traction, particularly in slippery and unstable conditions caused by excessive mud, sand, water, ice, or snow.

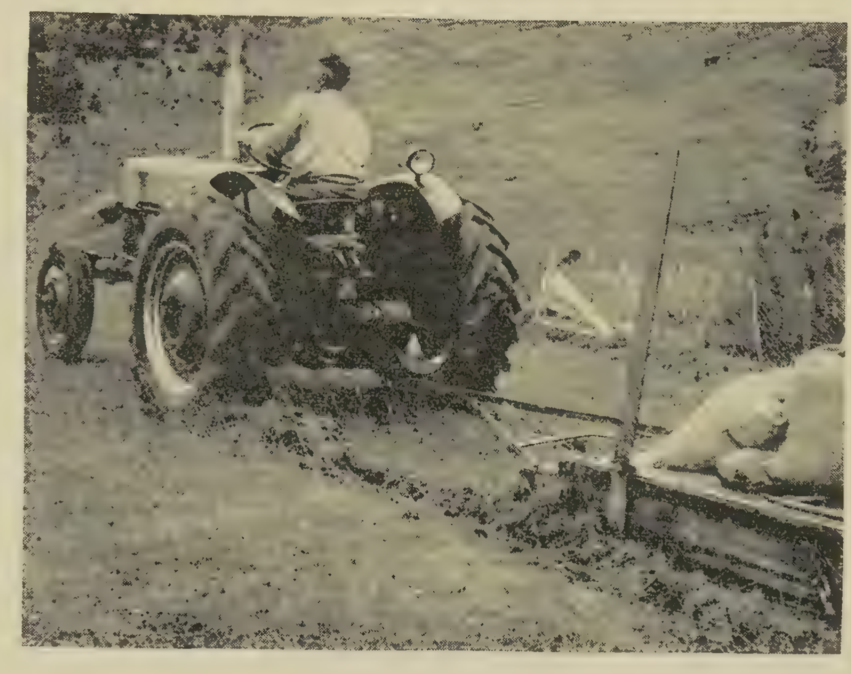
STANDARD differentials are to be found in tractors almost without exception and they are usually of similar construction to those found in cars and trucks. The differential allows the driving wheels of the vehicle to which it is fitted to revolve independently of one another as when the vehicle is cornering or to travel at the same speed as when it is travelling a straight course.

Other factors can cause a difference in rotating speeds of drive wheels; for example, one wheel on firm ground and one wheel in mud or on ice; or, when ploughing, one wheel on the land and the other in the softer soil in the furrow.

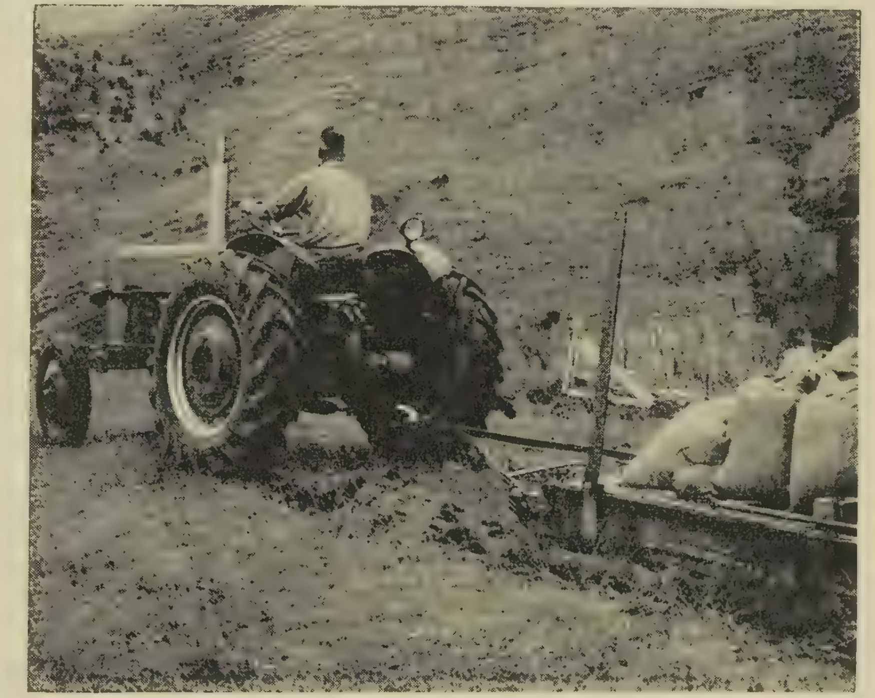
## The Differential

This difference in wheel speeds is accomplished in most cases by a crown wheel driven at right angles to the main drive shaft from the transmission by a bevel pinion wheel. Epicyloidal gears mounted in a cluster on the crown wheel have the two halves of the rear axle or differential shafts meshing with them. By this means the rear axles can revolve independently of one another or at the same pace according to the direction the vehicle is moving in or the relative amount of traction on the wheels. In fact in extreme cases rear wheels can revolve in opposite directions while the vehicle is travelling forward. The left-hand diagram on page 88 shows a differential unit.

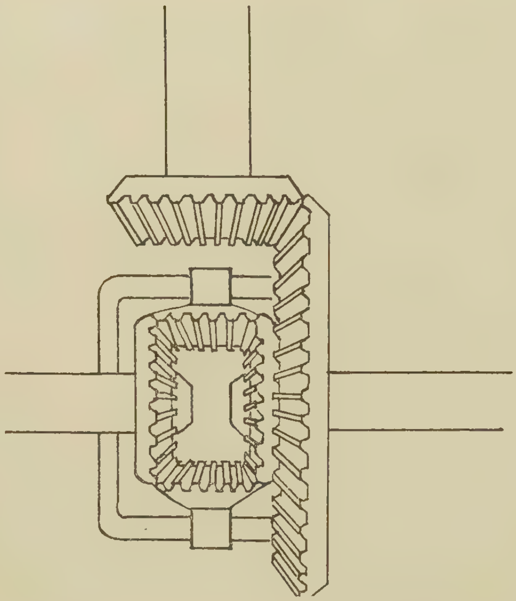
The braking systems on most modern wheel tractors utilise the differential to help in making the quick turns required for ploughing or row crop work. Most tractor brakes are independent for this reason and they work only on one wheel at a time unless locked together. They are in fact steering brakes. The brakes accentuate the differential action, stopping one wheel and speeding up the other, and thus bringing the tractor round in a very quick turn.



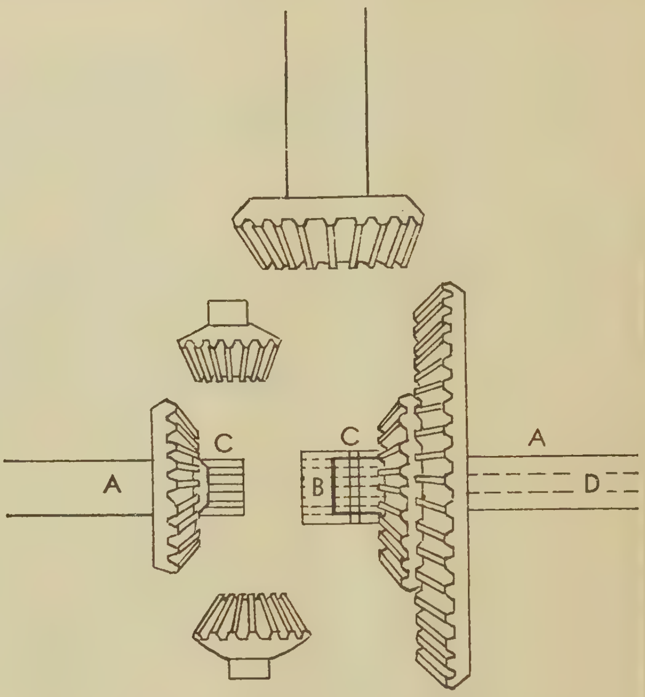
A tractor with a wheel spinning in soft going.



The same machine moving away with the differential locked. The device locks both halves of the rear axle together and makes the two rear wheels revolve in unison regardless of terrain or direction.



Conventional bevel gear on a differential unit. The differential allows the rear axles to revolve independently of one another or at the same pace according to the direction in which the vehicle is moving or the relative amount of traction on the wheels.



Exploded view of a differential with one type of differential lock. A—Differential shafts. B—Locking device with internal splines. C—Splined ends of differential shafts over which locking device B slides. D—Control rod through differential shaft.

## The Differential Lock

The differential lock, which has been fitted to many Continental tractors for some time, but which until recently has not been a feature of machines made in the United Kingdom, is new to New Zealand and is a device that locks both halves of the rear axle together and makes the two rear wheels revolve in unison regardless of terrain or direction.

This is accomplished in most cases by a splined sleeve or other sliding device which is operated through the centre of one of the differential shafts by a manual control and which is slid over or into the ends of the two differential shafts, locking them together. Some differential locks are spring loaded and will return the differential to normal operation when the pressure is taken off the actuating pedal or lever, but some must be moved manually both ways.

With the type that must be manually operated both into and out of the locking position care should be taken that the differential is not left locked when conditions are such that it is not required as an aid to traction. When this takes place tyre scrubbing will occur and manoeuvrability will suffer also. The right-hand diagram above shows a type of differential lock.

Tractor drivers should remember that:—

1. Tractors with a differential lock are not quite as easy to turn with the differential lock engaged as with it free and that some tyre scrubbing may occur on hard surfaces when turning.

2. The differential lock will give good, even traction to both rear wheels in difficult going and will often get a tractor through conditions where a tractor with the standard differential would be stuck. The differential lock is particularly useful for heavy loads under loose conditions, for example, ploughing, discing, grubbing, or harrowing.

3. The differential lock makes brakes act evenly on both wheels regardless of adjustment and in most cases gives the tractor better all-round surface adhesion when hills are being negotiated.

4. Where a sharp turn is required to avoid an obstacle or for inter-row cultivation the standard differential is advantageous and to this end the differential lock is disengaged for this type of work.

5. A tractor with a heavy drawbar load and with the rear wheels deeply embedded in mud will, with the differential locked, be more prone to somersaulting backward, for only one wheel needs a grip to cause this; whereas with a free differential both rear wheels must grip simultaneously. Once one rear wheel skids engine power is released to the outside and backward somersaulting cannot occur. Because the differential lock will often be used to move heavy loads under adverse conditions, drivers must always be on the watch for front-end lift and be ready to declutch to prevent backward somersaulting. The fitting of front-end weights will help counteract this danger.

6. The differential lock helps to enable the tractor to be loaded to capacity and so improve fuel economy because it eliminates wheel slip in one wheel at a time, which is often the factor limiting the load that can be hauled.

Operators of tractors fitted with differential locks should soon become used to handling them to the best advantage as work demands and to working with the free-running differentials at other times.

Generally the differential lock should prove to be a very useful device for wheel tractors to improve traction and to give additional control when required.

# Ice-cream and Frozen Desserts

HEADING PHOTOGRAPH: Ice-cream gateau.

By CHRISTINE LYONS,
Home Science Extension Officer, Department of Agriculture, Auckland

ICE-CREAM and frozen desserts are firm favourites with most households, especially during warm weather. When they are made from milk, eggs, and cream they have an appreciable food value, especially for those people (both children and adults) who will not drink milk. Also, they provide an easy method of giving a party touch to a meal, as they can be prepared beforehand and kept in the refrigerator until the last minute. Both home-made and bought ice-cream will repay imaginative serving, and the use of sauces as accompaniments adds considerably to their attraction.

WHEN ice-cream is made in a household refrigerator the temperature control should always be turned to its coldest temperature about an hour before the mixture is ready to be frozen. The lower the temperature is, the smaller will be the ice crystals formed. When mixtures are frozen to the desired consistency the temperature control can be turned back to normal, even when the mixture is not required immediately and is to be left in the refrigerator.

Ensure that the mixture is completely cold before putting it into the freezing compartment.

Stir the mixture every 15 to 20 minutes until it is half frozen; otherwise it will freeze hard at the bottom only. When the texture is mushy throughout it can be left undisturbed until the required consistency is reached. Alternatively, allow the mixture to become semi-frozen and then turn it into a pre-cooled basin, beat it thoroughly, and return it to the refrigerator immediately. This method does increase the length of the freezing time, but is generally considered the better of the two.

Some ice-cream type recipes do not need to be stirred during freezing. Often these contain stiffly beaten egg whites which give them a light and fluffy texture or else they contain a high proportion of eggs or cream.

Before refrigerators were as common in households as they are today pail-type freezers were used to make home-made ice-cream. These made excellent ice-cream, but they are now seldom used, mainly because refrigerators have taken their place.

The household refrigerator makes satisfactory ice-cream, but plainer mixtures are harder to freeze than are the richer mixtures. This is because they have a greater water content and, therefore, tend to form ice crystals

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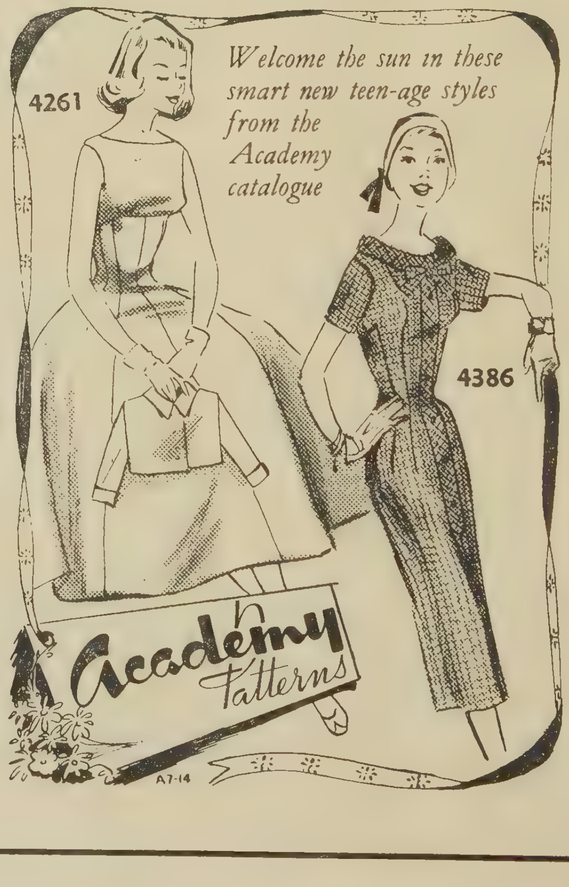

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more readily. The addition of gelatine in the approximate proportion of a teaspoon per pint of liquid helps the plainer mixtures, as the gelatine will absorb a large quantity of liquid in proportion to its weight, thus preventing the formation of ice crystals and giving instead the smooth, even texture associated with a good ice-cream.

The sweetening and flavouring of the mixture is important also. At room temperature the mixture should taste slightly over-sweetened and over-flavoured; otherwise the frozen result will be insipid. On the other hand the addition of too much sugar will prevent the mixture from freezing satisfactorily.

## RECIPES

### Vanilla Ice-cream

2 eggs
½ teaspoon of vanilla essence
1 cup of cream
3 tablespoons of sugar
1 cup of milk

(8 servings)

Heat the milk and sugar, add the beaten eggs, and stir the mixture until it coats the back of the spoon (as for custard). Cool. Add the slightly whipped cream, freeze until mushy. Turn the mixture into a cold bowl and whip until light and fluffy. Return it to trays and put in the refrigerator and freeze until the desired consistency is reached.

**Variations of Above Recipe**

After rewhipping the mixture add one of the following or a mixture (2 tablespoons) of them: 2 tablespoons of chopped dates, 2 tablespoons of chopped nuts, 1 tablespoon of chopped glace cherries and ½ tablespoon of chopped ginger, 2 tablespoons of coarsely chopped chocolate and one tablespoon of chopped nuts.

### Pineapple Ice-cream

1 egg
2oz. of sugar
1 cup of cream
¼ cup of drained, crushed pineapple
Pinch of salt
1 teaspoon of vanilla essence
½ cup of milk

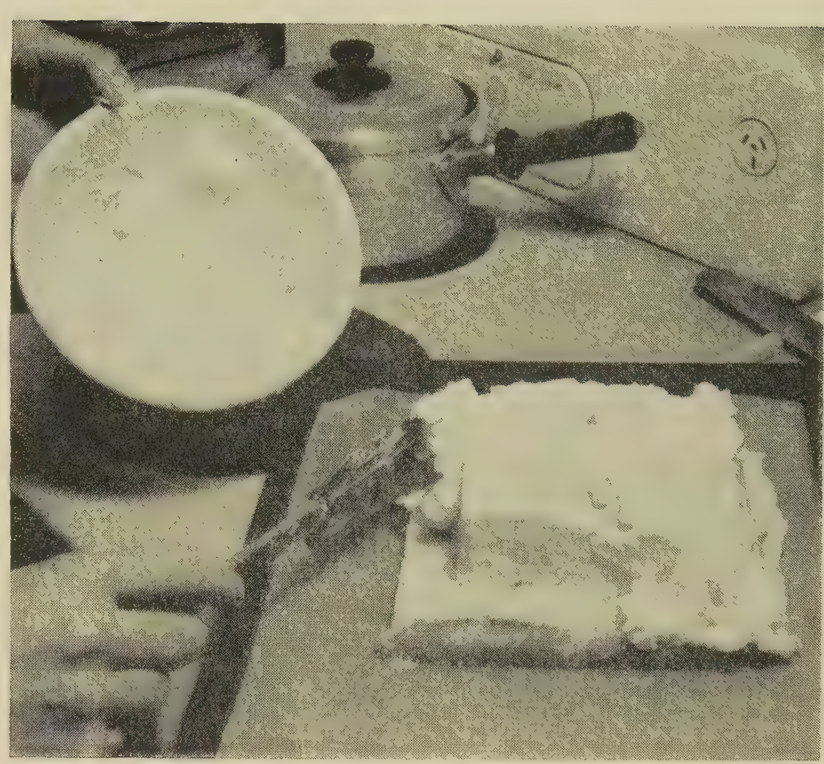
(6 to 8 servings)

Beat the egg and salt until fluffy and light. Beat in the sugar, 1 tablespoon at a time, until the mixture is pale. Add the vanilla essence. Whip the cream and fold into the egg mixture with the milk. Pour into the freezing tray and freeze until mushy. Turn into a chilled bowl and beat until fluffy but not melted. Fold in the pineapple and freeze to desired consistency.

### Party Ice-cream

1 tablespoon of sugar
Pinch of salt
1 egg white
½ cup of mashed, cooked peaches
6 marshmallows
2 tablespoons of chopped, crystallised cherries
2 teaspoons of flour
½ cup of milk
2 tablespoons of sugar
1 teaspoon of vanilla essence
2 tablespoons of toasted, chopped almonds
1 cup of whipped cream

(6 to 8 servings)



Baked alaska. The ice-cream and sponge are being covered with meringue mixture before they are baked in the oven.

Mix the 1 tablespoon of sugar, the flour, and the salt. Stir in the milk and cook the mixture in a double boiler for 15 minutes. Beat the egg white and the 2 tablespoons of sugar together and slowly pour the other mixture over them. Return to the boiler and cook for a further 2 minutes. Cool and add the peaches, almonds, cherries, vanilla essence, and chopped marshmallows. Fold in the cream. Put into a freezing tray and stir every 20 minutes or so until the mixture is firm.

### Fresh Strawberry Cream

½lb. of strawberries
1 tablespoon of lemon juice
8oz. of sugar
1 tin of chilled, unsweetened evaporated milk (11oz.)

(6 to 8 servings)

Crush the strawberries and add the sugar. Combine with the lemon juice and evaporated milk. Freeze until almost firm. Turn into a chilled bowl and whip until light and fluffy. Return to the freezing tray immediately and freeze until firm.

### Ice-cream Base

1 quart of milk
16oz. of sugar
¼ teaspoon of salt
4oz. of flour

(About 6 servings)

Mix the flour to a smooth paste with a little of the milk and then add the remaining milk with the sugar and salt. Bring the mixture to the boil, stirring constantly to prevent it from going lumpy. This mixture will keep for at least a fortnight in a refrigerator. When ice-cream is required turn the refrigerator control to the coldest temperature. Use 1 cup of base with 1 cup of cream and add any desired flavouring. Beat all together, freeze until mushy, turn into a cooled bowl, beat again, and then return to the freezing compartment and freeze until firm.

## Recipes Not Needing Stirring while Freezing

### Jiffy Ice-cream

1 tin (16oz.) of unsweetened condensed milk (chilled for at least 2 hours)
Pinch of salt
¾ to 1 cup of sifted icing sugar

(About 10 to 12 servings)

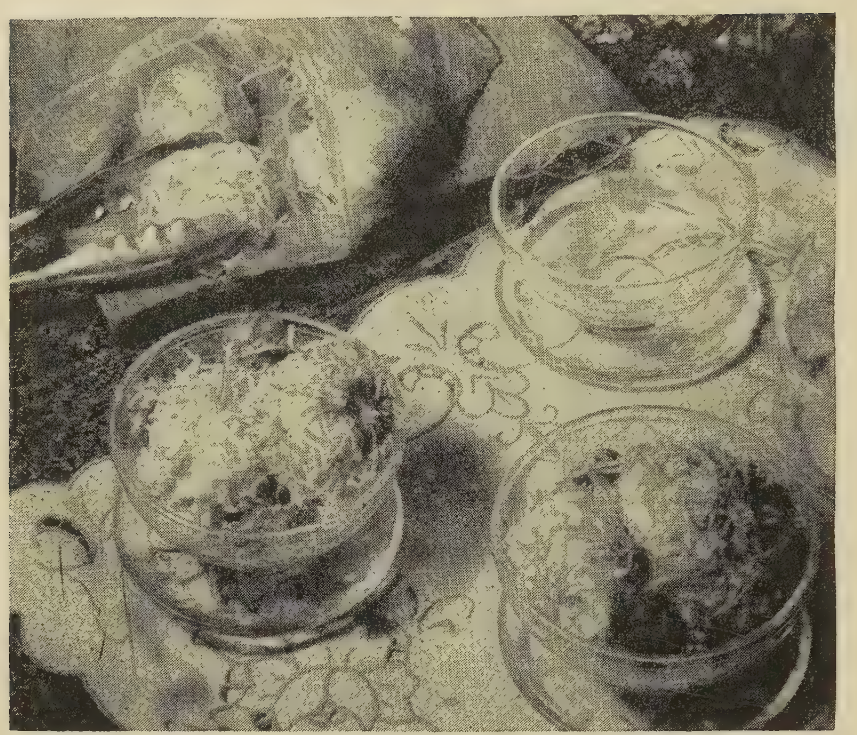
Whip the chilled milk and salt until stiff and then add the sifted icing sugar and any desired flavouring. Whip again and put into trays and freeze to desired consistency. No further beating is required.

### Apricot Mousse

¾ cup of cooked apricot pulp
1 egg white
¾ cup of whipped cream
4oz. of sugar

(8 servings)

Chill the pulp and then add the unbeaten egg white and beat until light and fluffy. Add the sugar to the



Coconut ice-cream balls. They should be stored in a plastic bag in the refrigerator until ready for use.

whipped cream, fold into the fruit mixture, and freeze without stirring.

### Butterscotch Parfait

1oz. of butter
¼ pint of water
½ pint of cream or ½ pint of chilled, unsweetened condensed milk
3oz. of brown sugar
4 egg yolks
1 teaspoon of vanilla essence

(10 servings)

Melt the butter and sugar in a saucepan and boil for 1 minute. Add the water and heat the mixture until the butterscotch is dissolved. Put the egg yolks into a basin and whisk until light and frothy. Add them gradually to the butterscotch mixture and continue to cook lightly for 5 minutes. Cool the mixture and then fold in the whipped cream (or evaporated milk) and vanilla essence. Freeze without stirring.

### Frozen Fruit Salad

1 tablespoon of flour
1 tablespoon of butter
Pinch of salt
1 orange cut into small sections
5 marshmallows
1 cup of whipped cream
½ cup of pineapple juice
1oz. of sugar
1 tablespoon of lemon juice
2 tablespoons of chopped nuts
½ cup of finely cut pineapple

(6 to 8 servings)

Mix the flour to a smooth paste with the pineapple juice and add the butter, sugar, and salt. Cook over a low heat for 10 minutes. Add the lemon juice, orange, nuts, pineapple, and cut marshmallows. Fold in the whipped cream. Freeze without stirring.

## Frozen Desserts

### Frozen Crumb Cake

2 tablespoons of chopped nuts, crystallised cherries, and ginger
1 cup of cream
2 cups of left-over sponge cake crumbs

(4 to 6 servings)

Combine the crumbs with the whipped cream. Add the nuts, cherries, and ginger. Put into the refrigerator tray and freeze. Serve with stewed fruit.

### Baked Alaska

1 piece of thin sponge cake, about 8in. x 6in. x 1in.
1 pint block of ice-cream
3 egg whites
6 tablespoons of sugar

(About 8 servings)

**Meringue:** Beat the egg whites until stiff, beat in half the sugar gradually, and then fold in the remaining sugar.

Place the cake on greaseproof paper laid on a baking tray. Put the ice-cream in the centre (the cake should be ½in. bigger all round than the block of ice-cream). Completely cover the cake and the ice-cream with the meringue mixture, making absolutely certain that there is no ice-cream showing. Bake in a very hot oven (450 degrees F.) for 4 to 5 minutes or until the meringue is a delicate brown. Transfer to a cold serving plate and serve at once.

### Ice-cream Gateau

Sponge cake
Sherry
Halved walnuts for decoration
1 small tin of apricots
Vanilla ice-cream
Whipped cream

Line a loaf tin about 8in. x 4in. x 4in. with greaseproof paper. Cover the bottom with a thin slice of sponge cake. Sprinkle with a mixture of apricot syrup and sherry and then cover with some thin slices of apricots and another layer of sponge. Spread the ice-cream over this, place another layer of sponge cake, sprinkle this with the syrup, then spread more sliced apricots and finally another layer of sponge cake sprinkled with syrup and sherry. Cover with greaseproof paper and place weights on top. Put in the freezing compartment and leave until thoroughly chilled and firm. Turn out on to a serving plate and decorate with whipped cream, sliced apricots, and walnuts.

### Strawberry Supreme

½lb. of strawberries
¼ to ½ cup of brandy
3oz. to 4oz. of sugar
Ice-cream

Mash the strawberries with the sugar, pour the brandy over this, and leave standing overnight. Serve the ice-cream in individual glasses and pour some of the strawberry sauce over each one.

### Coconut Ice-cream Balls

Ice-cream
Peppermint essence
Coarsely desiccated coconut
Green colouring

Roll scoops of the ice-cream in the coconut, which has been tinted green and flavoured with a few drops of the peppermint essence. Store the coconut balls in a plastic bag in the freezing compartment of the refrigerator until ready for use. Serve in sundae glasses with hot chocolate sauce.

## Sauces to Serve with Ice-cream

### Hot Chocolate Sauce

4 tablespoons of cocoa
8oz. of sugar
Pinch of salt
1 tablespoon of butter
½ cup of boiling water
¼ teaspoon of vanilla essence

(6 to 8 servings)

Put all the ingredients, with the exception of the vanilla, into a saucepan. Bring to the boil and boil for 5 minutes. Add the vanilla and serve very hot over ice-cream.

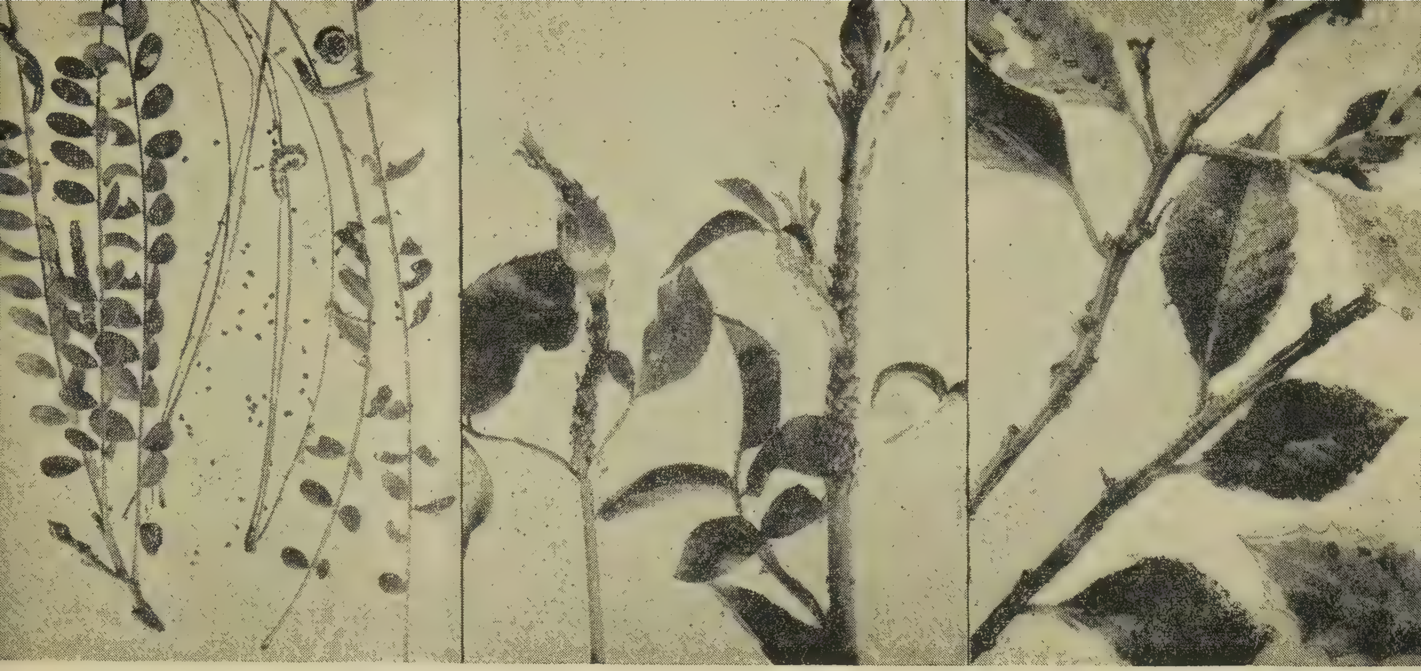
### Caramel Fudge Sauce

¾ cup of sugar
½ tablespoon of butter
1 tablespoon of chopped nuts
½ cup of boiling water
½ teaspoon of vanilla essence

(4 to 6 servings)

Melt the sugar in a heavy frying pan over a low heat. When it is a light brown remove from the heat, stir in the water, add the butter, and boil until a small amount forms a very soft ball when dropped into cold water. Remove from the heat and add the vanilla and chopped nuts. Serve hot with ice-cream.

All photographs by Sparrow.



HEADING PHOTOGRAPHS: Left—Kowhai moth caterpillars eating kowhai foliage. This is a typical chewing insect which can be controlled with lead arsenate, DDT, or lindane. Middle—Aphids are sucking insects which attack a wide range of plants. They should be controlled not only for the direct damage they cause, but also because they transmit virus diseases. Right—Scale insects attack most woody plants, causing severe damage if unchecked. The fungus sooty mould develops on the secretion from scales and aphids (shoot on right). Control of insects will control sooty mould.

# Pest and Disease Control in Flower Garden

**CORRECT cultivation will assist in growing healthy plants, but even in the best gardens pests and diseases attack the plants. In this article J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, deals with this aspect of flower gardening. Garden work notes for February are by Rosalie A. Campion, Horticultural Instructor, Department of Agriculture, Wellington.**

EFFICIENT control of pests and diseases will be obtained only if the gardener follows well-established principles: correct identification of the pest or disease present, the choice of the correct control material or materials, the efficient and timely application of these materials, and general garden hygiene.

## Identification

Identification is of prime importance. Unless the pest or disease is correctly identified, the wrong material may be used and little or no control obtained; this is probably the reason for most of the complaints by gardeners that they have been unable to control "the blight" or that the plants "still look sick". It is by no means easy always to identify the trouble exactly, but a careful examination of the plant and typical specimens submitted to an experienced person will assist. After identification the correct material can be applied.

## Choice of Correct Material

Chemicals used to control pests and diseases are collectively called therapeutants. Over the last few years a great range of new materials have been developed, which when correctly used will control pests and diseases more efficiently than was possible previously. However, some of the older materials such as bordeaux mixture or lead arsenate are still not superseded in efficiency.

Because of the wide choice available it is more than ever necessary for the gardener to choose the most suitable material and obtain it as the correct formulation. This is important not only to obtain the maximum efficiency but also to ensure that spray materials will mix satisfactorily (be compatible) without reaction between themselves or causing crop damage (phytotoxicity). Where an atomiser sprayer is used only materials in solution (solutions or emulsions) should be used. In a glasshouse smoke generators can be used to control many pests.

## Efficient Application

It is not always possible to choose the best weather to apply a spray or a dust, but the use of an efficient sprayer or duster will overcome this to a great extent. Suitable equipment was described in the August 1957 issue of the "Journal of Agriculture".

All equipment should be kept clean and in good working condition not only to apply the material efficiently but also to protect the gardener from unnecessary splashing through leaking washers, etc.

Whenever any spraying or dusting is carried out the whole of the plant should be covered with the material; it is not necessary to drench the plant or cover it in a heavy layer of dust. With suitable nozzles a fine, even film of material can be applied and this will not only be more effective but will also save money by the use of less material. It is seldom possible to control a trouble with one application; it will probably only check it. Two applications of the same material at approximately 5- to 10-day intervals will be much more effective and more likely to eradicate it.

## Garden Hygiene

For the same reasons that the housewife sweeps and cleans the house the gardener should practise good hygiene in the garden. Many pests shelter under pieces of brick or stone and diseases grow on dead or dying plant material, so regular cleaning up round the garden should be carried out and dead and diseased plant material burnt, not composted.

Weed control is another hygienic measure because weeds can harbour pests of ornamental plants; for instance, groundsel is a host for the "woolly bear" caterpillar which attacks cinerarias.

Large pruning cuts on ornamental trees should be made smooth with a knife and covered with petroleum jelly or bitumen to prevent the entry of fungal spores, especially those of silver leaf disease.

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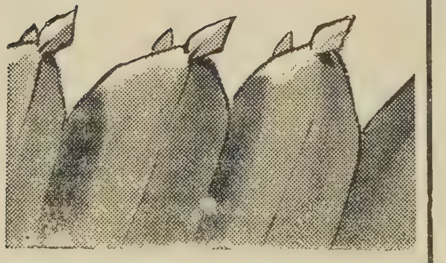

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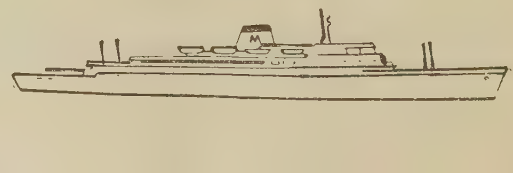


## SPRAY MATERIALS IN FLOWER GARDEN

### Precautions with Spray Material

The majority of spray materials are classified as poisons. Two commonly used materials, nicotine sulphate and lead arsenate, are highly poisonous. Other highly poisonous substances used by commercial producers are not available to home gardeners.

Spray materials, whether poisonous or not, should always be stored separately from household chemicals. They should be kept out of the reach of children, preferably locked in a cupboard, and surplus spray mixture should not be left in a bucket. Spray materials should either be kept in their original container or if placed in other bottles, those supplied for household chemicals should be used, and not soft drink or milk bottles. The bottles should be clearly labelled. Liquid materials classified as poisonous should be kept in their original poison bottles of standard hexagonal shape. These materials must be stored in a safe place.

Empty containers should be burnt or placed direct in a refuse bin and not used for other chemicals.

Ideally, spraying or dusting should be done only in calm weather, but this is not always possible for the weekend gardener. In any case the following precautions should always be taken.

1. Read the directions on the container.

2. Immediately after measuring out the required quantity replace the package in the cupboard.

3. Use therapeutants only when feeling well, not if ill or tired.

4. Preferably wear overalls or at least wear clothing which can be washed after spraying.

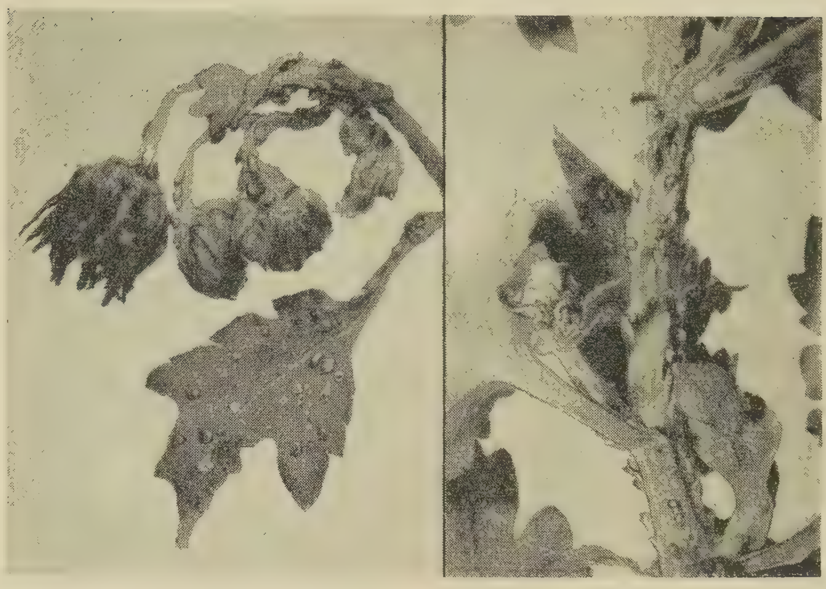
5. Avoid spray or dust drift as far as possible by spraying or dusting with the wind, not against it. If necessary protect nose and mouth with a special mask or a piece of gauze or handkerchief.

6. Do not smoke when spraying.

7. Wash thoroughly after spraying and before eating or drinking.

8. Do not clear blocked nozzles by blowing through them.

9. Wash out sprayers and buckets after use and pour the rinsings away.



*[Department of Scientific and Industrial Research*

Chrysanthemum gall midge distorts chrysanthemum shoots. The immature stages of the midge live in the galls. This pest is not yet present in all parts of New Zealand. Infected plants should be destroyed, and the remainder should be sprayed with malathion.

10. Spraying should be stopped if any discomfort is felt; the health of the gardener is more important than that of the plants.

(See Bulletin No. 386 of the N.Z. Department of Agriculture, "Health Aspects of Plant Therapeutants".)

### Spray Materials

There is a wide selection of spray materials formulated in various ways. The majority of the materials have been tested by the Plant Diseases Division, Department of Scientific and Industrial Research, and certified as suitable for the purpose for which they are sold (that they contain the ingredients stated). Preferably only certified materials should be purchased. Certification lists are published annually by the New Zealand Department of Scientific and Industrial Research.

The following list gives the main ingredients, the types of formulations available, and the purpose for which they are used.

**Fungicides**

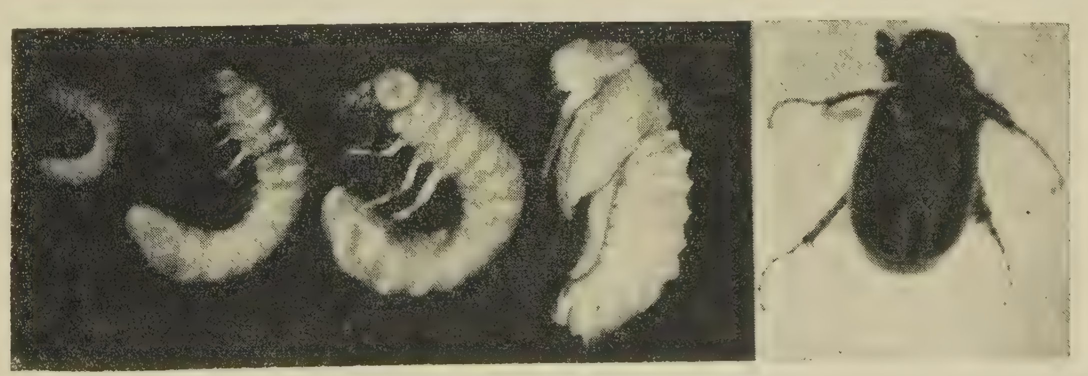
**Bordeaux mixture:** A mixture of copper sulphate and hydrated lime. Controls fungous diseases. Usual strength: 4oz. of copper sulphate, 5oz. of hydrated lime, 4 gallons of water.

**Captan:** Wettable powder. Controls leaf spot diseases such as black spot in roses and damping off in cuttings.

**Copper oxychloride:** Wettable powder. General fungicide; can be used as a seed dressing and soil drench. Replaces to some extent bordeaux mixture.

**Copper sulphate:** Crystals. Used in combination with hydrated lime to make bordeaux mixture.

**Dichlone:** Wettable powder. Seed dressing and soil drench.



Left—Young → stages of grass-grub, which lives in the soil and eats plant roots. Right—Adult beetle, which flies in summer and eats the leaves of plants. Both can be controlled with DDT applied to the soil or plants.

**Ferbam:** Wettable powder. General fungicide; also controls botrytis.

**Formalin:** Solution. Soil sterilant.

**Lime sulphur:** Solution. Controls powdery mildews and scale insects; in combination with colloidal sulphur controls rusts.

**Organic mercury:** Powder. Controls storage rots and surface-borne diseases on bulbs and corms.

**Streptomycin:** Solution. Controls bacterial diseases such as blast.

**Sulphur** (colloidal): Liquid or powder. Controls powdery mildews; also combined with lime sulphur.

**Sulphur:** Dust. As a dust against powdery mildew.

**Thiram:** Wettable powder. A general fungicide controlling leaf spot diseases and botrytis; can be used as a seed or bulb dressing.

**Zineb:** Wettable powder. General fungicide, especially controls rusts.

### Insecticides

**Aldrin:** Wettable powder. Controls soil insects. Also protective bulb dip against bulb fly.

**Azobenzene:** Aerosol or smoke. Controls mites in glasshouses.

**DDD:** Wettable powder. Controls caterpillars, especially leaf roller caterpillars.

**DDT:** Wettable powder, emulsion, dusts, and smokes. Controls most chewing insects except leaf roller, grass-grub when applied to turf, and some sucking insects as thrips, but **not** aphids or mites.

**Derris:** Wettable powder. Partial control of aphids and chewing insects.

**Lead arsenate:** Wettable powder. Controls chewing insects only.

**Lindane (also known as gamma BHC):** Wettable powder, emulsion, dust, and smoke. Controls chewing insects, some sucking insects such as aphids and thrips, **not** mites.

**Malathion:** Emulsion, wettable powder. Controls sucking insects including mites and scales. Some chewing insects.

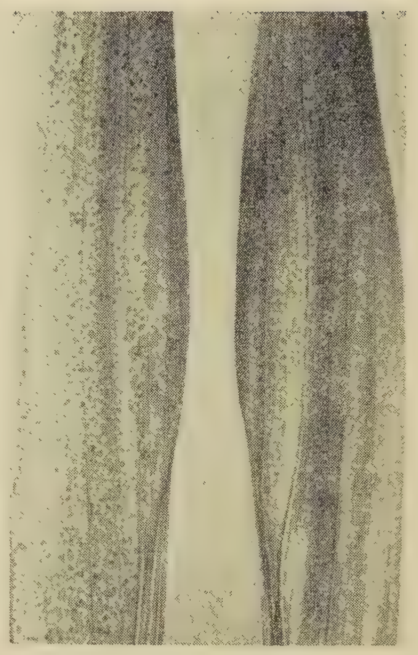
**Nicotine sulphate:** Liquid. Controls sucking insects, not chewing insects; should be applied in warm weather. Should have soft soap added when not mixed with alkaline materials.

**Summer oil (white oil):** Liquid. Controls scales and mites.

**Winter oil (red oil):** Liquid. Controls scales and mites in dormant season; overwintering eggs of aphids. Should not be used on foliage.

## Spreaders or Stickers

Though spray materials are formulated to mix with water, better adhesion to the leaves and coverage can be obtained by the use of spreaders or stickers in the spray mixture. The following materials can be used in small quantities: Household detergents, summer oil (not with sulphur sprays), skimmed milk or casein, soft soap with nicotine, and proprietary spreaders and stickers.



Leaf spot diseases such as botrytis can be controlled by spraying with fungicides.

## Types of Pests and Diseases

Pests attacking plants can be broadly divided into chewing insects and sucking insects; most of these attack the plant from outside, but eelworms (microscopic organisms), mining insects, and gall insects live for some part of their lives within the plant itself.

Rust diseases are easily identified by the orange pustules which break through the leaf surface. They are difficult to control, but repeated spraying with lime sulphur or zineb will assist.

### Soil Inhabiting Pests

The larvae or immature stages of grass-grub and certain moths live in the soil and chew the roots of plants. They can be controlled by the use of DDT or aldrin dressed over the soil or watered round plants when attacked.

Millepedes chew into the base of fleshy plants such as delphiniums. Control is by improved drainage and watering with DDT.

Slaters or woodlice live under stones or rotten wood and eat young shoots of plants. Control by clearing up rubbish and dusting with DDT.

Slugs and snails live under stones, low-growing plants, and in long grass; they are especially active in wet weather. Control by clearing rubbish, cutting grass, and using slug and snail baits based on metaldehyde.

Eelworms are microscopic pests which live in the soil and penetrate the plants; they are especially damaging either to the roots (root knot eelworm), bulbs, such as narcissus and iris, or above ground in the leaves of phlox and chrysanthemums. There is no chemical control on infected plants. Infected soil must either be sterilised with heat or the soil fumigant chloropicrin. Infected plants should be destroyed, though infected bulbs can be treated when dormant by placing in a bath of hot water for 2 to 3 hours at 110 degrees F., accurately maintaining this temperature while the bulbs are in the water.

### Chewing Pests above Ground

Chewing pests above ground are mainly caterpillars of various types, which can be controlled by spraying or dusting with lead arsenate, DDT, or lindane to leave a deposit of chemical on the plant. Other chewing insects are weevils and the adults of grass-grub, the green vegetable bug, and insects such as cicadas and katydids. Control is by contact spraying with malathion or DDT emulsion.

### Sucking Pests

Sucking pests are particularly damaging, as they draw the sap from plants and usually reproduce very quickly. In addition thrips, and especially aphids, spread virus diseases by moving from infected plants to healthy plants. Thrips can be controlled with DDT or lindane. They can persist on gladiolus corms in store and these should be dusted with lindane.

Aphids are controlled with nicotine sulphate in warm weather or lindane or malathion. They can also persist on bulbs such as tulips or iris in store, and spread virus among these bulbs. Before storing, bulbs should be dusted with lindane.

Scale insects live on the branches and leaves of woody plants; they can be controlled in the growing season by spraying with summer oil plus nicotine sulphate or on deciduous plants in winter with winter oil or lime sulphur.

Mites are very small insects which live mainly on the undersides of leaves, causing a speckled, dry appearance. Control in summer with malathion or summer oil and where possible in winter with winter oil.

### Leaf Inhabiting Pests

Certain pests live within plant tissue; these are leaf miners, gall midges, and eelworms.

Leaf miners make tunnels within the leaves and are controlled with DDT or lindane emulsions. Natural parasites may assist control.

Gall midges cause raised areas on leaves of chrysanthemums or excessive growth on shrubs like golden akeake; in general, gall midges are difficult to control, but repeated spraying with malathion may assist. Galls on trees and shrubs should be pruned off and burnt.

Eelworms live within the leaves of plants like chrysanthemum and phlox. There is no chemical control available to home gardeners. Severely infected plants should be destroyed.

## Diseases

Plant diseases may be caused by fungi of various types, bacteria, viruses, or from unsuitable growing conditions (physiological reasons).

### Soil-borne Diseases

Soil-borne diseases can be caused by fungi such as verticillium, sclerotinia, and phytophthora. They normally cause the plants to wilt and die; certain fungous diseases cause "damping off" in seedlings and cuttings. Diseases producing wilting in plants cannot be controlled in the plants and these should be destroyed. As the diseases persist in the soil, this should be sterilised with heat or formalin drench, where no other plants are growing, or by watering with dichlone or copper oxychloride among growing plants.

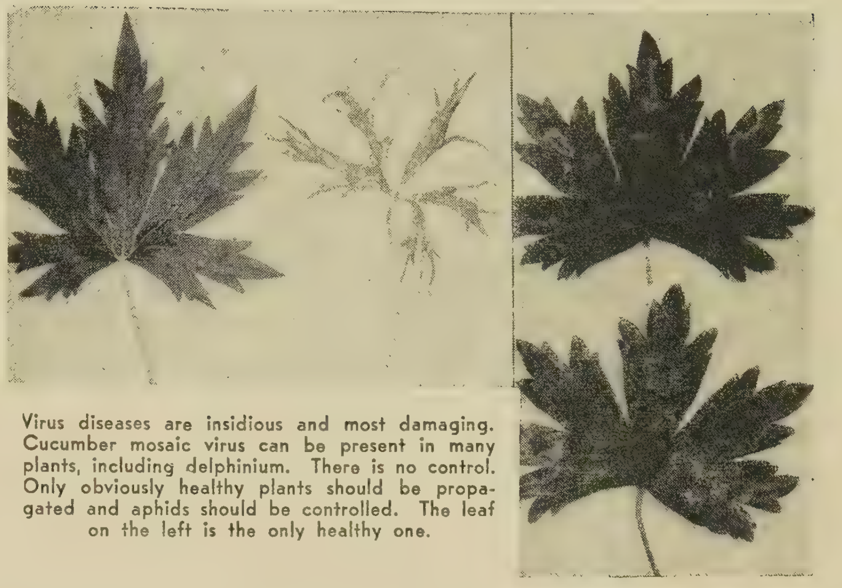
Damping off can be prevented by dusting seeds before sowing with dichlone, thiram, or captan, and cuttings can be watered with captan.

One bacterial disease, crown gall, produces gall on the roots of plants. At present there is no chemical control. Severely attacked plants should be destroyed; in less severe cases the galls can be cut off and the plant set out in clean soil and watered with captan.

### Diseases within the Plant

Most fungous diseases live within the plant tissues, having arisen from spores which alight on the plant and germinate, penetrating into the plant. Spraying or dusting with a fungicide to protect the plant and kill the spores is the most satisfactory method of maintaining healthy plants.

Diseases causing leaf spots on roses, carnations, irises, rhododendrons, etc., can be prevented or controlled by spraying or dusting with copper oxychloride, captan, thiram, or zineb.



Virus diseases are insidious and most damaging. Cucumber mosaic virus can be present in many plants, including delphinium. There is no control. Only obviously healthy plants should be propagated and aphids should be controlled. The leaf on the left is the only healthy one.

Rust diseases produce yellow pustules on geraniums, roses, chrysanthemum, hollyhock, and iris, etc. These can be controlled with lime sulphur plus colloidal sulphur or zineb.

A white powdery deposit on the leaves of sweet peas or delphiniums is caused by powdery mildews, which are controlled by spraying or dusting with sulphur.

A black deposit on leaves of trees and shrubs is caused by sooty mould, a fungus living on the secretions of scales or aphids. This is remedied by controlling the insects on the plants.

### Bacterial Diseases

Two bacterial diseases cause a browning or blackening of young shoots of trees and shrubs. These diseases are fireblight and blast. Infected material should be cut out and burnt and the plant sprayed with copper oxychloride or streptomycin.

### Virus Diseases

Virus diseases have not as yet been fully identified as to their origin and make up. They are usually described by the symptoms they cause (streak, mosaic, ring spot, etc.). They are normally present in all parts of the plant in the sap and are transmitted by propagating from infected material or by aphids; spotted wilt virus is spread by thrips.

The majority of viruses can infect a range of plants; for instance cucumber mosaic virus infects plants as diverse as daphne, gladiolus, cucumbers, and tomatoes.

A few virus diseases like narcissus mosaic infect only one type of plant or plants of the same family.

Virus diseases produce a variety of symptoms, depending on the actual virus and the plant infected by it. Typical symptoms are:—

Yellow spots, blotches, or ring-like patterns on the leaves.

Mosaic or marbling pattern on leaves.

Distorted flowers on chrysanthemums and dahlias.

Colour changes (breaking) in the petals of bulbous plants such as tulips, sparaxis, gladiolus, and in shrubs like camellias.

There is no chemical control of virus diseases at present. The only practical method of eradicating a virus disease is by destroying infected plants, controlling aphids or thrips, and propagating from healthy material. Where possible plants should be raised from seed, as only a few viruses are seed borne.

## Physiological Disorders

At times plants may appear unhealthy and yet not be attacked by any specific pest or fungous disease. The commonest cause is unsuitable growing conditions, such as the soil being too wet or too dry, strong winds (especially if salt laden), frost, and an excess or deficiency of plant nutrients. These conditions can be overcome by an improvement in the soil condition and by protection from the weather. An excess of naturally occurring plant nutrients such as lime cannot be easily counteracted and in this case it is better to grow plants which tolerate this condition.

## Soil Sterilisation

Because of the presence of soil-borne insects and diseases and weed seeds in ordinary soil it is important to sterilise soil for seed sowing and raising seedlings in boxes.

# Identifying Disorders in the Flower Garden

To ensure efficient control of pests and diseases it is essential to identify the trouble correctly. The following table lists the symptoms caused by pests, diseases, and unsuitable growing conditions, some of the plants likely to show these symptoms, and the cause and the control where applicable.

| Symptoms | Types of plants | Cause | Control |
|---|---|---|---|
| **1. Root Disorders** | | | |
| Root brown and rotting | All plants | Excess water | Improve drainage |
| Root showing brown staining | Trees, shrubs, roses | Infection by soil fungi | No control in severe cases; remove plants and drench soil with dichlone or copper oxychloride |
| Roots swollen and cracked | Many plants | Infection by root knot eelworm | No control. Once plants removed, soil can be sterilised with chloropicrin |
| Galls on roots | Trees, shrubs, herbaceous plants | Infection by crown gall. (Note legumes such as lupins and sweet peas have natural galls) | Destroy plants in severe cases; in milder cases remove galls; drench with captan |
| Bulbs soft and rotting | Narcissus, iris, nerines | (a) Infected with eelworm<br>(b) Attacked by narcissus flies | Lift and treat in hot water.<br>Lift, treat in hot water, dip in aldrin, 0.2 per cent. before replanting; dust with DDT in growing season |
| Corms soft and rotting | Gladiolus, ixias, freesias | Soil- or corm-borne diseases | Dip in organic mercury or dust in thiram before planting. Plant in fresh soil. Store in ventilated place and dust with thiram |
| Rhizomes soft and rotting | Bearded iris, callas | Soft rot bacteria | Lift and cut out diseased part; dust area with captan. Callas can be dipped in formalin 2 per cent. when dormant |
| Plants have few or no roots | Herbaceous plants | Grass-grub or soil caterpillar | Water with DDT; dress area with DDT or aldrin |
| Seeds fail to germinate | All plants | (a) Soil too wet or dry or caked<br>(b) Soil-borne fungi | Improve soil conditions.<br>Dust seed with dichlone, thiram, or captan before sowing |
| **2. Bases of Plants** | | | |
| Shoots chewed off | Herbaceous plants | (a) Slaters or woodlice<br>(b) Slugs and snails<br>(c) Millepedes | Dust with DDT; clear up old wood and stones.<br>Use metaldehyde baits; clear up stones and long grass;<br>clear up plant refuse round plants |
| Seedlings "damp off" at base | All plants | Soil-borne fungi | Dust seed with dichlone, thiram, or captan before sowing; dust seedlings with these materials. In seed boxes sterilise soil |
| Bark stained brown | Trees and shrubs | Phytophthora collar rot | Improve drainage; stake firmly; water with copper oxychloride |
| Cuttings stained at base | Carnations, soft wooded material | Soil-borne fungi | Drench with captan; sterilise propagating medium |
| **3. The Whole Plant** | | | |
| The plant wilts | All plants | (a) Check for root disorders, dryness, poor drainage, etc.<br>(b) Infection by verticillium wilt | As in Section 1<br>No control; drench soil with dichlone or copper oxychloride; propagate from healthy material |
| Shoots die | Herbaceous plants | Check for damage to base of shoot | |
| Branches die | Trees and shrubs | Borer | Cut out and burn severely infected parts; inject DDT or benzine in holes and plug them |
| Gumming on trunk | Ornamental cherries and plums | (a) Damage<br>(b) Blast disease | Spray with streptomycin or copper compounds |
| Branches die, leaves retained | Pyracantha, cotoneaster, etc. | Fireblight disease | Cut out and burn infected material |
| Whole plant or several branches have silvery appearance | Ornamental prunus, poplars | Silver leaf disease | No cure; cut out infected wood and burn; protect wounds. In severe cases dig out and burn plants |
| **4. Shoots** | | | |
| Leaves and shoots covered in black deposit | Camellias, roses, other trees, and shrubs | Sooty mould | Control scale insects or aphids with summer oil and nicotine sulphate |
| Tips of young shoots blackened | Trees and shrubs | (a) Wind damage or frost<br>(b) Blast disease | Prune back and protect plants.<br>Spray with streptomycin or copper compounds |
| Galls on shoots | Acacias, akeake | Gall insects | Prune off early in season |
| Scars on shoots | Trees and shrubs | Cicada and katydids | Spray with DDT or malathion |
| White cottony deposit on shoots | Hydrangeas and other shrubs | Cottony cushion scale | Spray with summer oil or DDT emulsion |
| Grey-white deposit on shoots | (a) Cotoneaster, crab apple<br>(b) Roses and ornamental rubus | Woolly aphis<br>Rose scale | Spray with lindane<br>Spray with summer and winter oils and malathion |
| Small raised areas on shoots | Waratahs, camellia, many other trees, and shrubs | Scale insects | Spray with summer oil or malathion |
| Tips of shoots tied together | Many shrubs | Leaf roller caterpillar | Spray with DDD, malathion, or lead arsenate |
| Shoots and branches die | Lawson's cypress and other conifers | Cypress canker | Cut out infected material; spray with copper compounds |
| Yellow tips and leaves | Shrubs, annuals | Nutritional excess or deficiency | Improve soil conditions |
| **5. Leaves** | | | |
| Leaves spotted with grey, brown, or black areas | Herbaceous plants and annuals | Various leaf spot fungi | Spray with copper compounds, thiram, captan, or zineb |
| Leaves have yellow pustules | Hollyhock, iris, geranium, silver birch, etc. | Rust diseases | Spray with lime sulphur plus colloidal sulphur or zineb |
| Leaves have silvery appearance (whole twig or branch affected) | Prunus, poplars, and other trees and shrubs | Silver leaf disease | No control. Cut out infected wood and burn; protect wounds |
| Powdery grey deposit on leaves | Sweet pea, dephinium, roses | Powdery mildew | Spray or dust with sulphur compounds |
| Leaves have silvery appearance and brown sticky deposit on under surface | Rhododendron, laurustinus, gladiolus | Thrip damage | Spray with DDT or lindane |

# IDENTIFYING DISORDERS IN THE FLOWER GARDEN *(Continued)*

| Symptoms | Types of plants | Cause | Control |
|---|---|---|---|
| Leaves have dried, minute spots; may be covered in web on underside | Many plants | Mite damage | Spray with malathion or summer oil; use winter oil on deciduous plants in dormant period |
| Leaves have irregular yellow spots, blotches, or lines | Camellia, daphne, dahlia, etc. | Virus diseases | No control. Propagate from healthy plants and control aphids |
| Brown margins to leaves | Rhododendrons, other shrubs | (a) Weather damage | Provide protection |
| | | (b) Soil conditions, root damage | Improve soil conditions |
| Leaves with irregular holes and margins | All plants | (a) Caterpillars, beetles | Spray or dust with lead arsenate, lindane, or DDT |
| | | (b) Green vegetable bug | Spray with malathion or DDT emulsion |
| Mines in leaves | Cineraria, oaks, beech, azalea, chrysanthemum | Leaf mining insects | Spray with lindane |
| Raised galls on leaves | Chrysanthemum | Gall midge | Destroy severely infected plants; spray with malathion |
| Dry areas between veins of leaves | Chrysanthemum, phlox | Eelworm | Destroy severely infected plants |
| **6. Flowers** | | | |
| Plants flower when very small | Annuals | Poor growing conditions | Improve the cultivation |
| Plants fail to flower | Shrubs | (a) Unsuitable growing conditions | Lack or excess of plant nutrients, plant unsuitable for the area |
| | | (b) Raised from seed instead of by vegetative means | Will flower in due course |
| Flowers variegated, spotted, or blotched | Gladiolus, sparaxis, tulips | Virus diseases | Destroy plants; control aphids on plants and in store |
| Flowers covered in grey deposit | Dahlias, hydrangeas, etc. | Botrytis disease | Destroy infected blooms; spray with captan or thiram |
| Base of petals and stamens stained purply black | Carnations and other dianthus | Anther smut disease | No control: Burn infected plants. If severe, destroy all such plants in the garden |

Soil can be sterilised either by heat or by chemicals. Sterilisation by heat is more effective, as it controls insects, fungi, and weeds, but the chemicals available to home gardeners are not so effective for weed control. Neither method can be carried out among living plants; in this case soil drenches should be applied.

### Sterilisation by Heat

In sterilisation by heat the soil is heated to a minimum temperature of 180 degrees F. for 10 minutes; excessive heating may affect the soil condition, but for efficient sterilisation the minimum temperature and time must be maintained.

When sterilising by heat, the soil should be well broken down and fertilisers or manures should not have been added. Once the treatment is completed and the soil is cool it should be turned several times with a clean shovel before mixing with sand, leafmould, and fertilisers.

Where the gardener regularly needs soil for seed sowing proprietary electrical sterilisers are efficient and easy to use. For small quantities soil can be treated by baking in the oven or by steam. The latter method can be carried out by placing loose, dry, sifted soil in an open-mesh sack and suspending this above briskly boiling water in a domestic copper. The copper should be covered. Individual boxes of soil may also be sterilised by watering with boiling water and covering the treated boxes with a clean sack; the soil must be allowed to dry out partially before seeds are sown or seedlings set out.

### Chemical Sterilisation

Chemical sterilisation can be done by the use of formalin or chloropicrin. Some household disinfectants are recommended for this purpose. They will mainly control soil insects. The disadvantage of chemical methods is that the chemical must have dissipated before the soil can be used; and this break down is slow in cold weather when sterilised soil is normally required.

Formalin is effective against soil-borne diseases and should be used as a 2 per cent. solution (1 pint to 6 gallons of water). The soil should be saturated and left for at least 3 weeks before use.

Chloropicrin controls diseases, soil insects, and most weeds; it is applied undiluted to the soil; holes should be made at 10in. to 12in. spacings or at different depths in a heap of soil, and the material applied at 2 to 5 millilitres (1 teaspoon = about 5 millilitres) to each hole. The holes should be filled in, the soil covered, and left for at least a week. It should be turned before use and should not be used until the smell of chloropicrin has disappeared completely.

### Soil Drenches

Two fungicides, copper oxychloride and dichlone, can be used as a soil drench round plants attacked by soil-borne fungous diseases such as verticillium or phytophthora. They will not entirely kill these diseases, but may check them sufficiently to allow the infected plants to grow more strongly. They can also be used to drench the soil before replanting is done in areas where an infected plant has been removed.

For further information regarding the strength of therapeutants to apply and pest and disease control of ornamentals, fruit trees, and vegetables reference can be made to Bulletin No. 390, "Disease and Pest Control in Gardens and Orchards", published by the New Zealand Department of Agriculture.

## Work for February

After holidays away the length of the lawn grass invariably catches the eye of the gardener and mowing then becomes a priority task. If the grass is more than 2in. high, it is best to reduce it in two cuttings 3 to 4 days apart so that sudden exposure of the lower parts of the plants is avoided and they can green up satisfactorily. The clippings can be scattered thinly round the bases of shrubs and trees. If these clippings are placed in a thick layer, they decompose and form a hard mat which is rather impervious to water. Instead of helping to conserve soil moisture, the heat of decomposition may dry out the soil and cause damage to the roots.

### Compost Heaps

Lawn clippings can be used satisfactorily on the compost heap provided they are well mixed with other plant materials. Dead flower heads and any healthy plants which are past their usefulness should be added to the bins rather than wasted by burning. Between 6in. layers of plant debris it is desirable to place a layer of soil, thus incorporating useful bacteria in the heap. A light dusting of lime should be added to alternate layers. Where soil is not available sawdust can be used instead. The heap should not be allowed to dry out and during this season it may be necessary to water the heap occasionally as it is being built.

# *What you get for what you pay*

That is the classic test of value, but it can't be applied without a knowledge of the facts. So we turn the spotlight on... *freight rates.* The money which a shipper pays to send a consignment overseas is, in fact, a calculated proportion of the cost of operating the ship and this in turn is the total of many different items.

Some of these will be obvious to anyone who is familiar with ships. There are, to begin with, the "daily costs" of the ship's voyage, which are continuous whether she has cargo on board or not. Clearly these include the wages of the crew, the stores and provisions required to maintain them and the ship, and the cost of fuel. Also under this head are included the dues which must be paid at each port visited and each canal traversed, together with the cost of insurance against loss or damage of vessel, crew and cargo. Less obvious perhaps is a group of items which is not directly related to any particular voyage. Nevertheless, each trip must bear its proportion of these expenses, which include the cost of servicing and repairs, including dry-docking. Also under this head comes a proportion of the cost of the survey which, under British Ministry of Transport regulations, every ship must undergo every four years.

Next come the "cargo costs" which arise from the loading and discharging of cargo and the transhipment charges which must be paid at the ports of loading and discharge.

And finally there are the normal overhead expenses common to every large-scale organisation — administration expenses, office salaries, cost of maintaining shore establishments and so on.

Add these things together and you have the shipowner's outgoings; and what does it all come to, in terms of actual cash?

Today, a round trip (New Zealand — London — New Zealand) costs *well over four times* as much as it did before the war; and even then the comparison is incomplete, for no account has been taken of Depreciation, a heavy charge which on a new ship today is running at a level of *about six times* as much as it did in pre-war years.

Increases of such magnitude are matters of grave concern to the shipowner, but they are not automatically passed on to the shipper. Everything possible is done to offset them, with the result that the average of freight rates today is only *just over three times* as much as it was before the war.

Issued in the interests of mutual understanding by

NEW ZEALAND OVERSEAS SHIPPING LINES

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Should the compost heap give off an offensive odour, it is generally a sign that it is not sufficiently aerated and should be turned as soon as possible. If flies are prevalent because the heap is not properly covered with soil or sawdust, DDT dust should be sprinkled liberally over the surface.

Compost heaps should be ready for turning about 4 to 5 weeks after they are completed. Turn the outside material into the centre when restacking and apply water if the material is dry. The compost should be ready for use after another 8 weeks.

## Disbudding Chrysanthemums

Though the efficient disbudding of flower heads is considered essential only for show work, most chrysanthemums other than pompons and Korean types also respond to some thinning of the buds. On the early varieties buds will be developing in a cluster at the top of each shoot. All the buds except the central one should be removed as they become large enough to handle without damaging the main stem. Should the main bud be accidentally damaged, one of the side buds should be left to take its place.

If growth is slow, a side dressing of a mixed fertiliser at 2oz. per square yard should be given after thorough watering. The following proportions should be satisfactory:—

Sulphate of ammonia, 2 parts by weight
Superphosphate, 2 parts by weight
Sulphate of potash, 1 part by weight

To help combat the many pests and diseases which attack chrysanthemums throughout the season one of the following spray mixtures combining insecticides and fungicides should be applied at 3-weekly intervals:—

| | |
|---|---|
| Lindane emulsion (20 per cent. material) .. | ½ fl. oz. |
| Thiram .. .. .. | 1¼oz. |
| Water .. .. .. | 4 gallons |

**Or**

| | |
|---|---|
| DDT emulsion .. .. | 1 fl. oz. |
| Lime sulphur .. .. | 3½ fl. oz. |
| Colloidal sulphur .. | 1½oz. |
| Water .. .. .. | 4 gallons |

## New Plants from Cuttings

Throughout the summer months of January and February a wide range of new plants can be raised by taking cuttings of plant material which has completed its growth but which has not yet become hard and woody. Cuttings taken at this stage of growth are referred to as half-ripe cuttings. The range of plants which will strike at this season is so wide that for the home gardener it is worth while attempting to root any desired plants. Cuttings can vary in length between 1½in. to 4in. Those from manuka, boronia, erica, and prostanthera are best taken from the inside of the plant. They should be about 1½in. long and have the leaves removed from the lower half. Cuttings from hydrangea, fuchsia, abutilon, oleander, luculia, and other shrubs should be made 3in. to 4in. long. The lower leaves should be removed and any remaining large leaves likely to droop on the ground and start rotting can be cut in half. This also reduces the area through which the plant transpires.

Any healthy plant material and refuse can be used on the compost heap. A series of bins such as these simplify the necessary task of turning the heap.

The cuttings should be placed in a container of open material such as sand and watered into position. Containers can be placed in a closed frame or in a shaded position. If cuttings are grown in pots, the whole pot can be enclosed in a polythene bag as illustrated below and placed in the shade. This reduces transpiration and the cuttings root readily. The cuttings should be inspected regularly to see that they do not dry out or that those under polythene do not become too humid, thus encouraging the growth of damping-off fungus.

Half-ripe cuttings inserted in a pot of sand and completely enclosed in a polythene bag. By the reduction of transpiration in this manner the cuttings root more readily.

Geranium cuttings will strike readily this month and where frosts tend to kill the plants during winter a frame can be used to hold the rooted cuttings over until next spring. These cuttings should be about 4in. long. If the growth is very sappy, the cuttings should be left overnight so that the cut ends dry out before planting. They will be less susceptible to the blackleg fungus which often causes the death of cuttings.

## Budding of Ornamentals

Keen gardeners who have suitable stocks for budding roses, lilac, and ornamental flowering trees may do this work now. Roses are best budded on to a thornless stock such as *Rosa multiflora* and lilac can be budded on to the common privet. Both of these stocks must be grown from properly prepared cuttings taken in the autumn before budding. Seedling peaches or nectarines which are in their first year of growth and with main stems of about pencil thickness may be budded to form ornamental flowering trees.

Select budwood from strong current season's growth of the desired parent. Make a T-shaped cut in the bark of the stock near ground-level and lift the bark gently to allow the freshly cut bud to be inserted. Bind the bud firmly into position with raffia or strips of P.V.C. plastic, leaving only the bud itself exposed.

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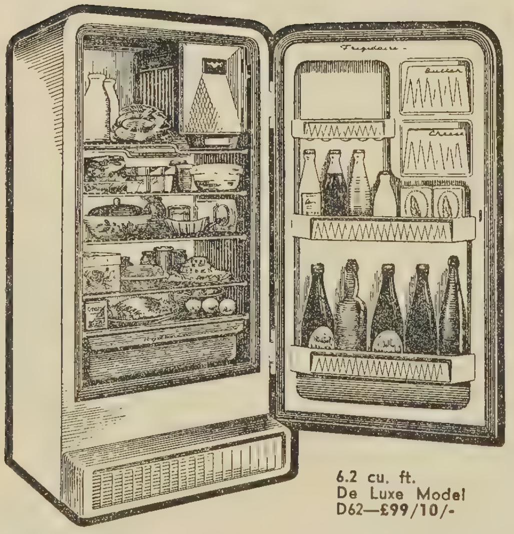

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# WORK IN THE FLOWER GARDEN IN FEBRUARY

[*Sparrow*

**Lawn and flower gardens need constant attention during summer.**

## Trimming of Hedges

Evergreen hedges should receive a further light trimming this month so that they have time to recover and look attractive over winter. The light clippings make useful additions to the compost heap. Evergreen shrubs may also receive a light trim to help retain their shape. *Rhododendron fragrantissima* is a desirable but somewhat open shrub which can be made more compact by nipping back the tips while the bushes are young and inducing a multiplication of shoots before the growth hardens.

## Summer Attention to Roses

Rambler roses will be well past blooming by now, and the annual pruning should be attended to. This entails the removal, as near ground-level as possible, of all shoots which have flowered and allows the entry of more light and air to the young shoots, which should be tied into place. Where powdery mildew is evident sulphur sprays should be applied.

The perpetually flowering rose, Lorraine Lee, can be pruned now to encourage the winter blooms. Replace any spent wood with vigorous young growths and cut back any old flowering stems. Cuttings of this rose 5in. long taken now can be successfully rooted in a shaded position. The removal of dead flower heads and a further application of a mixed fertiliser as suggested for chrysanthemums at 2oz. per square yard will help to improve the later crop of blooms. It is also necessary to continue spraying or dusting for the control of insect pests and diseases, and the following spray mixture will be satisfactory:—

Captan or thiram 50 per cent., 2 tablespoons (1oz.)

Colloidal sulphur (75 per cent. powder), 1 tablespoon (¾oz.)

Malathion wettable powder, 1 tablespoon (¾oz.)

Water, 4 gallons

## Lawn Preparation

The best time for laying down new lawns in most districts is toward the end of next month, but before a lawn is sown the ground should be thoroughly prepared from now on. In areas where hard frosts are experienced lawns should be sown by the end of this month.

The ground can be well cultivated by digging or by using a rotary hoe and should be well consolidated following this by tramping heavily over the area with the heels. The top 1½in. should be lightly hoed and loosened before it is raked level. When the weed seeds have germinated this light hoeing and raking can be repeated.

## General

Though next month is suitable for the main planting of bulbs, a start should be made where convenient with some of the earlier plantings of bulbous irises, crocuses, winter aconites, snowdrops, grape hyacinths, and other bulbs. If the soil is heavy, and river sand can be obtained, it should be placed round bulbs.

Old cyclamen corms should be knocked out of their pots and repotted. Seedling cyclamen can be potted up in readiness for winter flowering. The base of the corm should be sitting on top of the potting mixture.

Continue lifting gladiolus and check for the appearance of thrip damage. DDT emulsion spray should be applied where this is evident.

In the warmer areas cuttings of Marguerite daisies taken now will develop into excellent flowering plants by mid-winter. Newer varieties are becoming available and are a great improvement on the old, single, white variety.

Where early flowering sweet peas are desired seed should be sown in the warmer districts. A well-drained and well-enriched soil is desirable.

Good-quality blooms of pot marigolds or calendulas can be obtained from seed sown this month. In northern districts the many good varieties give an excellent mid-winter and spring display.

Vigorous young growths from favourite violas can now be divided and replanted. In this way a cheap and effective border can be maintained.

Seed of Iceland poppies for winter flowering in a warm, sunny area should be sown now in boxes in a shaded position. Seed of many strikingly coloured varieties is available.

# An Attractive Two-toned Pullover

A LIGHT-WEIGHT pullover is a very acceptable addition to any man's summer wardrobe and is considered an essential garment by many men. The two-toned pullover, illustrated at right, is both stylish and practical. Directions for making this quickly knitted garment are given below.

**ABBREVIATIONS:** K., knit; p., purl; st., stitch(es); inc., increase; dec., decrease; rep., repeat; patt., pattern; cont., continue; beg., beginning; mn., main colour; c., contrasting colour; sl., slip; wl. bk., wool back; wl. fwd., wool forward; in., inches; alt., alternate; rem., remain(ing).

**Measurements:** Length (from shoulder) 23in.; chest, 38in. to 40in.

**Materials:** 5oz. of 3-ply wool (main colour); 4oz. of 3-ply wool (contrasting colour); 1 pair of No. 12 and 1 pair of No. 7 knitting needles.

**Tension:** 9 st. to 1in. on No. 7 needles.

## The Back

With No. 12 needles and c. wool cast on 130 st. and work 1 row in k. 1, p. 1 rib.

Change to mn. wool and k. 1 row.

Now cont. in k. 1, p. 1 rib until work measures 4in. from cast-on edge, ending after a row on the right side (the right side does not show the contrasting p. st.).

Next row: Rib 6, * inc. in next st., rib 8, rep. from * 12 times, inc. in next st., rib 6. (144 st.)

Change to No. 7 needles and cont. in patt. thus:—

1st row: With c. wool k. 1, sl. 1 to end. (Right side.)

2nd row: With c. wool sl. 1, wl. bk., k. 1, wl. fwd. to end.

3rd row: With mn. wool sl. 1, k. 1 to end.

4th row: With mn. wool k. 1, wl. fwd., sl. 1, wl. bk. to end.

These 4 rows form the patt.

Cont. in patt. inc. at both ends of the next row and every foll. 6th row until there are 170 st. Cont. without further shaping until back measures 14in.

### To Shape Armholes

Cast off 6 st. at beg. of next 2 rows, then dec. at both ends of next 4 rows, then at both ends of every alt. row until 134 st. rem. Cont. without further shaping until back measures 23in.

### To Shape Shoulders

Cast off 14 st. at beg. of next 6 rows. Cast off rem. 50 st.

## The Front

Work as for back until front measures 20in. ending after a wrongside row.

### To Shape Neck

Patt. 50 st. and leave on a spare needle for left front, cast off 34 st., patt. to end.

Now cont. on these 50 st. for right front thus:—

1st row: Patt. to end.

2nd row: K. 2 tog., patt. to end.

Rep. these 2 rows until 42 st. rem. Cont. without further shaping until front measures 23in. ending at side edge. Cast off 14 st. at beg. of next and foll. alt. rows twice.

Join wool at neck edge of left front and work to match right front.

## Neck Ribbing

Join left shoulder seam, then using mn. wool and No. 12 needles, pick up and knit 160 st. evenly all round neck edge. Work ½in. in k. 1, p. 1 rib, ending with a row on the wrong side. Now work 2 more rows in rib, then change to c. wool and with right side facing k. 1 row. Work 1 row in k. 1, p. 1 rib with c. wool.

Cast off fairly loosely in rib.

## Armhole Borders

With right side of work facing and using No. 12 needles and mn. wool pick up and k. 166 st. evenly along right armhole edge. (83 each side of shoulder seam.)

Work ½in. in k. 1, p. 1 rib, ending with a row on the wrong side.

Now work 2 more rows in rib, then change to c. wool and with right side facing k. 1 row.

Work 1 row in k. 1, p. 1 rib with c. wool.

Cast off fairly loosely in rib.

Join left shoulder seam and work armhole band to match.

## To Make Up

Press work lightly with hot iron and damp cloth. Join and press side seams.

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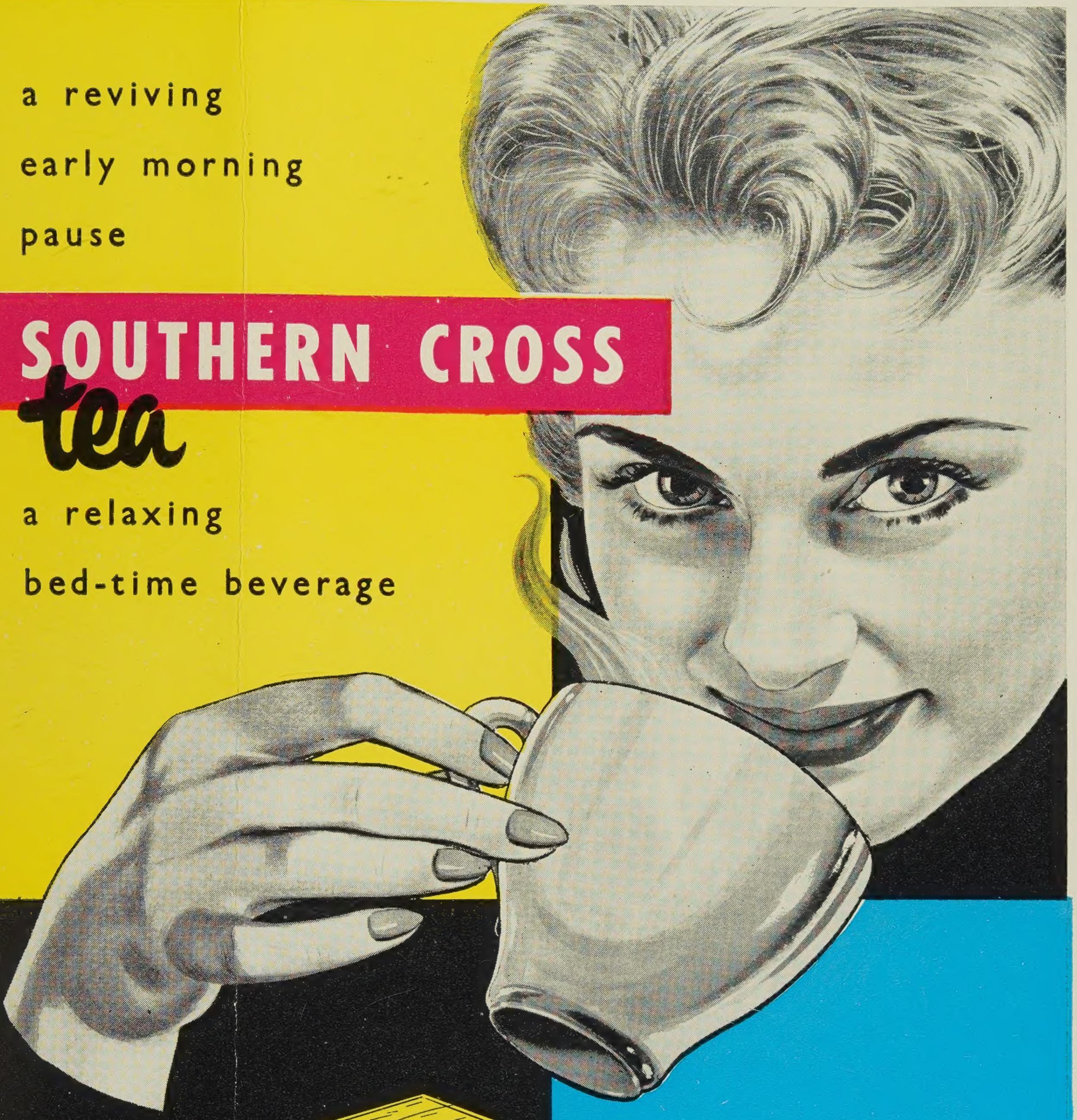

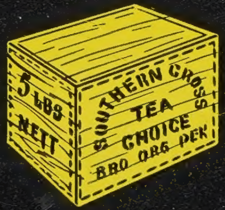
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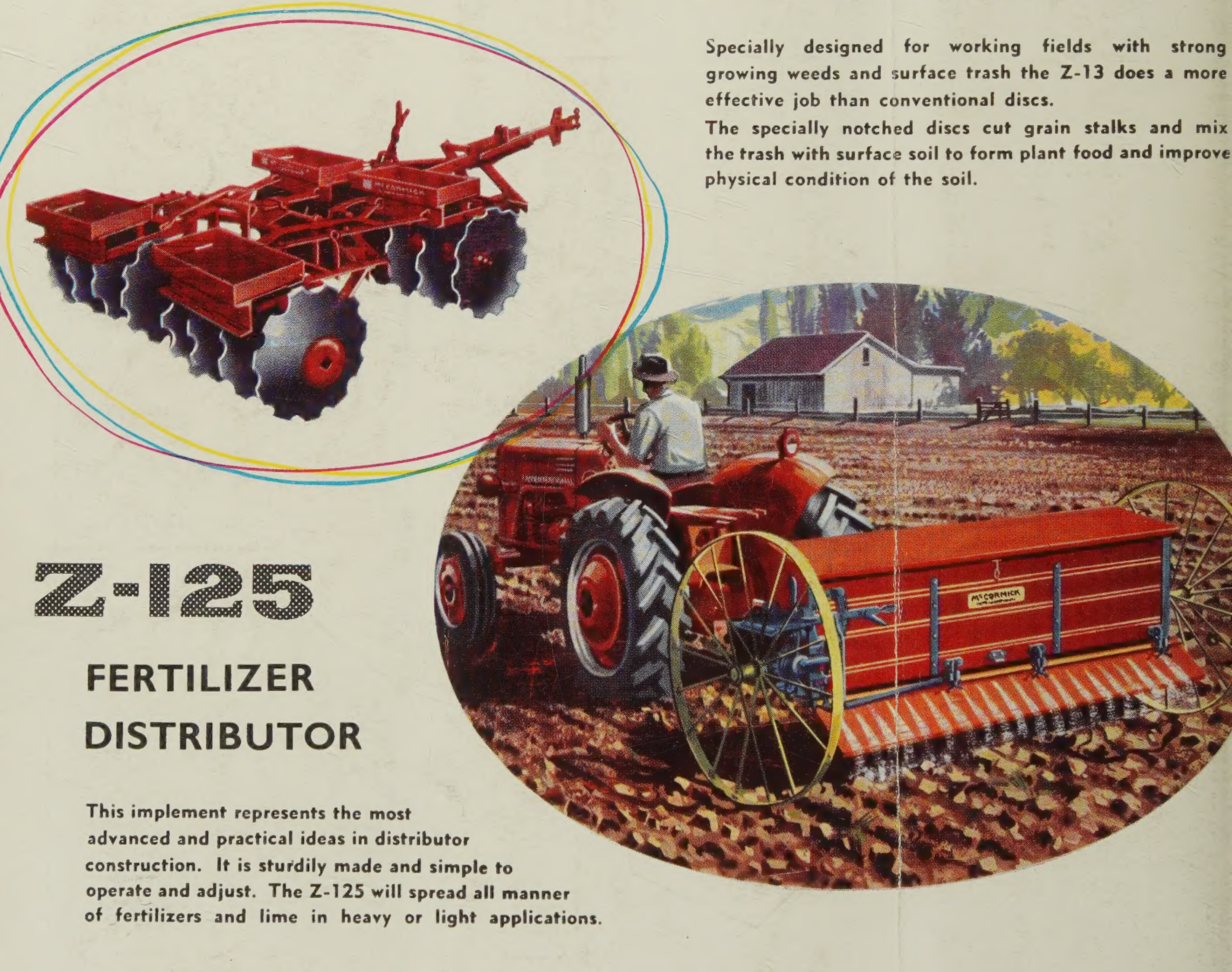

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